INDEX

Important Identities :-

1) $(a+b)^2 = a^2 + 2ab + b^2$

2) $(a-b)^2 = a^2 - 2ab + b^2$

3) $a^2 - b^2 = (a+b)(a-b)$

4) $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ OR $a^3 + b^3 + 3ab(a+b)$

5) $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ OR $a^3 - b^3 - 3ab(a-b)$

6) $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ OR $(a+b)^3 - 3ab(a+b)$

7) $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ OR $(a-b)^3 + 3ab(a-b)$

8) $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac.$

9) $a^3 + b^3 + c^3 = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ac) + 3abc$

   If $a+b+c = 0$ $a^3 + b^3 + c^3 = 3abc$

1. RATIO & PROPORTION, INDICES, LOGARITHMS

Ratios

A.   Features
1.   Comparison : A ratio is comparison of the size of the sizes of two or more quantities of the same kind by division.
2.   Same Unit : The two quantities should be the same unit.
3.   Lower terms : Ratio is expressed in lowest terms.
4.   Fraction : If 'a' and 'b' are the quantities of the same kind, the fraction a/b is called the ratio of 'a' and 'b'.
5.   Antecedent : The first term 'a' is called antecedent.
6.   Consequent : The second term 'b' is called consequent.

B.   Inverse Ratio
1.   The reciprocal of the given ratio is called the inverse ratio.
2.   If ratio is a:b, then its inverse ratio is b:a.

C.   Compound Ratio :
1.   The product of ratios obtained by multiplying the fractions (denoting the ratios) is called compounded ratios.
2.   The compound of a/b and c/d is ac/bd.

D.   Duplicate Ratio :
1.   When two equal ratios are multiplied, the product is the duplicate ratio.
2.   The duplicate ratio of a:b is $a^2 : b^2$.

E.   Sub Duplicate Ratio :
1.   The square root of the given ratio is the sub-duplicate ratio.
2.   The sub-duplicate ratio of a : b is $\sqrt{a} : \sqrt{b}$

F.   Triplicate Ratio :
1.   When three equal ratios are compounded, the product is called the triplicate ratio.
2.   The triplicate ratio of a : b is $a^3 : b^3$.

G.   Sub-triplicate Ratio :
1.   The third root of the given ratio vs sub-triplicate ratio.
2.   The sub- triplicate ratio of a:b is $\sqrt[3]{a} : \sqrt[3]{b}$.

H.   Continued Ratio :
1.   The relation between the magnitudes of three or more quantities of the same kind.
2.   The continued ratio of three similar quantities a, b, c is a:b:c.

Part - I
Ratio
(Module + Scanner)
Set - A

1. Ratio exists only between quantities of _____ kind.
   a) same   b) bigger
   c) smaller   d) None

2. A ratio is a _____.
   a) unit   b) term
   c) number   d) function

3. The order of the terms in a ratio is important.
   a) True   b) False
   c) Partly True   d) None of the above

4. A ratio is expressed in _____ form.
   a) simplest   b) complicated
   (c) moderate   d) functional

5. Ratio has no unit.
   a) True   b) Partly True
   c) False   d) None of the above

6. If a : b = c : d then
   a) ab = cd   b) ac = bd
   c) ad = bc   d) ab = ad

7. The inverse ratio of 11 : 15 is
   a) 15 : 11   b) $\sqrt{11}:\sqrt{15}$
   c) 121 :225   d) none of these

8. The ratio of two quantities is 3 : 4. If the antecedent is 15, the consequent is
   a) 16   b) 60
   c) 22   d) 20

9. The ratio of the quantities is 5:7. If the consequent of its inverse ratio is 5, the antecedent is
   a) 5   b) $\sqrt{5}$
   c) 7   d) none of these

10. The duplicate ratio of 3 : 4 is
    a) $\sqrt{3}:2$ b) 4 : 3
    c) 9 : 16   d) none of these

11. The sub-duplicate ratio of 25 : 36 is
    a) 6 : 5   b) 36 : 25
    c) 50 : 72   d) 5 : 6

12. The triplicate ratio of 2 : 3 is
    a) 27 : 8   b) 24 : 81
    c) 2 : 3   d) none of these

13. The triplicate ratio of 4 : 5 is: *(Scanner)*
    a) 125 : 64   b) 16: 25
    c) 64 : 125   d) 120 : 46

14. The sub-triplicate ratio of 8 : 27 is
    a) 27 : 8   b) 24 : 81
    c) 2 :3   d) none of these

15. The ratio compounded of 2 : 3, 9 : 4, 5 : 6 and 8 : 10 is
    a) 1 : 1   b) 1 : 5
    c) 3 : 8   d) none of these

16. The ratio compounded of 4 : 9 and the duplicate ratio of 3 : 4 is
    a) 1 : 4   b) 1 : 3
    c) 3 : 1   d) none of these

17. The ratio Compounded of 4:5 and sub-duplicate of "a":9 is 8:15. Then value of "a" is: *(Scanner)*
    a) 2   b) 3
    c) 4   d) 5

18 The ratio compounded of 4 : 9, the duplicate ratio of 3 : 4, the triplicate ratio of 2 : 3 and 9 : 7 is
    a) 2 : 7   b) 7 : 2
    c) 2 : 21   d) none of these

19. The ratio compounded of duplicate ratio of 4 : 5, triplicate ratio of 1 : 3, sub duplicate ratio of 81 : 256 and sub-triplicate ratio of 125 : 512 is
    a) 4 : 512   b) 3 : 32
    c) 1 :12   d) none of these

20. If a : b = 3 : 4, the value of (2a + 3b) : (3a + 4b) is
    a) 54 : 25   b) 8 : 25
    c) 17 : 24   d) 18 : 25

21. If A:B = 2:5, then (10A + 3B):(5A + 2B) is equal to: *(Scanner)*
    a) 7 : 4   b) 7 : 3
    c) 6 : 5   d) 7 : 9

22. If x : y = 3 : 4, the value of $x^2y + xy^2 : x^3 + y^3$ is
    a) 13 : 12   b) 12 : 13
    c) 21 : 31   d) none of these

23. If p : q = 2 : 3 and x : y = 4 : 5, then the value of 5px + 3qy : 10 px + 4qy is
    a) 71 : 82   b) 27 : 28
    c) 17 : 28   d) none of these

24. If $\dfrac{p}{q} = -\dfrac{2}{3}$ then the value of $\dfrac{2p+q}{2p-q}$ is :   *(Scanner)*
    a) 1   b) -1/7
    c) 1/7   d) 7

25. If a : b = 3 : 7 then 3a + 2b : 4a + 5b = ?
    a) 27 : 43   b) 23 : 47
    c) 24 : 51   d) 29 : 53

26. If $5x^2 - 13xy + 6y^2 = 0$, then x : y is
    a) (2 : 1) only   b) (3 : 5) only
    c) (5 : 3) or (1 : 2)   d) (3 : 5) or (2 : 1)

27. If $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = k$ then $\dfrac{pa+qc+re}{pb+qd+rf}$ equals
    a) k   b) (p + q + r) k
    c) $\dfrac{1}{k}$ d) None of these

28. Two whole numbers whose sum is 72 cannot be in the ratio
    a) 5 : 7   b) 3 : 5
    c) 3 : 4   d) 4 : 5

29. If $15(2p^2 - q^2) = 7pq$, where p and q are positive, then p : q will be: *(Scanner)*
    a) 5 : 6   b) 5 : 7

c) 3 : 5   d) 8 : 3

30. Ratio between 25 minutes and 45 seconds.
    a) 100 : 3   b) 5 : 9
    c) 4 : 5   d) 3 : 10

31. If 40% of a number is equal to two – third of another number, what is the ratio of first number to the second number?
    a) 2 : 5   b) 3 : 7
    c) 5 : 3   d) 7 : 3

Set - B

1. Two numbers are in the ratio 2 : 3. If 4 be subtracted from each, they are in the ratio 3 : 5. The numbers are
    a) (16, 24)   b) (4, 6)
    c) (2, 3)   d) none of these

2. The angles of a triangle are in ratio 2 : 7 : 11. The angles are
    a) (20°, 70°, 90°)   b) (30°, 70°, 80°)
    c) (18°, 63°, 99°)   d) none of these

3. Division of Rs.324 between X and Y is in the ratio 11 : 7. X & Y would get Rupees
    a) (204, 120)   b) (200, 124)
    c) (180, 144)   d) none of these

4. Anand earns Rs.80 in 7 hours and Promod Rs. 90 in 12 hours. The ratio of their earnings is
    a) 32 : 21   b) 23 : 12
    c) 8 : 9   d) none of these

5. The ratio of two numbers is 7:10 and their difference is 105. The numbers are
    a) (200, 305)   b) (185, 290)
    c) (245, 350)   d) none of these

6. P, Q and R are three cities. The ratio of average temperature between P and Q is 11 : 12 and that between P and R is 9 : 8. The ratio between the average temperature of Q and R is
    a) 22 : 27   b) 27 : 22
    c) 32 : 33   d) none of these

7. Simplify the ratio 1/3 : 1/8 :1/6

a) 8 : 4 : 3   b) 8 : 3 : 4
c) 4 : 3 : 8   d)   none of these

8.   The ratio 3 / 2 : 1 / 3 : 1/ 8 is same as
a) 36 : 3 : 8   b) 3 : 8 : 36
c) 36 : 8 : 3   d) 3 : 36 : 8

9.   X varies inversely as square of y. Given than y = 2 for x = 1. The value of x for y = 6 will be equal to
a) 3   b) 9
c) 1/3   d) 1/9

10. Two numbers are respectively 30% and 40% more than a third number. The ratio of two numbers is
a) 3 : 4   b) 14 : 14
c) 13 : 14   d) 4 : 3

11. A person has assets worth Rs.1,48,200. He wish to divide it amongst his wife, son and daughter in the ratio 3 : 2 : 1 respectively. From this assets, the share of his son will be:
(Scanner)
a) Rs.24,700   b)   Rs.49,400
c) Rs.74,100   d)   Rs.37,050

12. The number which when subtracted from each of the terms of the ratio 19 : 31 reducing it to 1 : 4 is
a) 15   b) 5   c) 1   d) none of these

13. Two numbers are in the ratio 2:3 and the difference of their squares is 320. The numbers are: *(Scanner)*
a) 12, 18   b)   16, 24
c) 14, 21   d)   None

14. What must be added to each term of the ratio 49 : 68, so that it becomes 3 : 4?
(Scanner)
a) 3   b)   5
c) 8   d)   9

15. The ratio of no. of boys and the no. of girls in a school is found to be 15 : 32. How many boys and equal no. of girls should be added to bring the ratio of 2/3?

a) 20   b) 19
c) 23   d) 27

16. Find three numbers in the ratio 1 : 2 : 3, so that the sum of their squares is equal to 504
(Scanner)
a) 6, 12, 18   b)   3, 6, 9
c) 4, 8, 12   d)   5, 10, 15

17. The salaries of A, B and C are of ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are done to their respective salaries, then find the new ratio of the salaries.
a) 23 : 33 : 60   b) 33 : 23 : 60
c) 23 : 60 : 33   d) 33 : 60 : 23

18. Divide 80 into two parts so that their product is maximum, then the numbers are:
(Scanner)
a) 25, 55   b)   35, 45
c) 40, 40   d)   15, 65

19. If A, B and C started a business by investing Rs.1,26,000, Rs.84,000 and Rs.2,10,000. If at the end of the year profit is Rs.2,42,000 then the share of each is: *(Scanner)*
a) 72,600, 48,400, 1,21,000
b) 48,400, 1,21,000, 72,600
c) 72,000, 49,000, 1,21,000
d) 48,000, 1,21,400, 72,600

20. Daily earnings of two persons are in the ratio 4:5 and their daily expenses are in the ratio 7 : 9. If each saves Rs.50 per day, their daily earnings in Rs. are
a) (40, 50)   b)   (50, 40)
c) (400, 500)   d)   none of these

21. The ages of two persons are in the ratio 5:7. Eighteen years ago their ages were I the ratio of 8:13, their present ages (in years) are:
(Scanner)
a) 50, 70   b)   70, 50
c) 40, 56   d)   None

22. If the salary of P is 25% lower then that of Q and the salary of R is 20% higher than that of

Q, the ratio of the salary of R and P will be:
(Scanner)
a) 5 : 8 b) 8 : 5
c) 5 : 3 d) 3 : 5

23. The incomes of A and B are in the ratio 3 : 2 and their expenditures in the ratio 5 : 3. If each saves Rs.1,500, then B's income is:
(Scanner)
a) Rs.6,000 b) Rs.4,500
c) Rs.3,000 d) Rs.7,500

24. Incomes of R and S are in the ratio 7 : 9 and their expenditures are in the ratio 1 : 5. Their total expenditure is equal to income of R. What is the ratio of their savings?
a) 23 : 36 b) 28 : 41
c) 31 : 19 d) 35 : 19

25. Ratio of earnings of A and B is 4 : 7. If the earnings of A increase by 50% and those of B decrease by 25%, the new ratio of their earning becomes 8 : 7. What is A's earning?
(Scanner)
a) Rs.21,000 b) Rs.26,000
c) Rs.28,000 d) Data inadequate.

26. The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms. In 5 hours, the speed of the first train is
a) 10 Km/hr b) 50 Km/hr
c) 70 Km/hr d) none of these

27. The students of two classes are in the ratio 5 : 7, if 10 students left from each class, the remaining students are in the ratio of 4 : 6 then the number of students in each class is:
(Scanner)
a) 30, 40 b) 25, 24
c) 40, 60 d) 50, 70

28. In 40 litres mixture of glycerine and water, the ratio of glycerine and water is 3 : 1. The quantity of water added in the mixture in order to make this ratio 2 : 1 is: *(Scanner)*
a) 15 litres b) 10 litres
c) 8 litres d) 5 litres.

29. An alloy is to contain copper and zinc in the ratio 9 : 4. The zinc required to melt with 24 kg of copper is: *(Scanner)*
a) $10\frac{2}{3}$ kg b) $10\frac{1}{3}$ kg
c) $9\frac{2}{3}$ kg d) 9kg

30. A vessel contained a solution of acid and water in which water was 64%. Four litres of the solution were taken out of the vessel and the same quantity of water was added. If the resulting solution contains 30% acid, the quantity (in litres) of the solution, in the beginning in the vessel, was.
a) 12 b) 36
c) 24 d) 27

31. The ratio of the number of boys to the number of girls in a school of 720 students is 3 : 5. If 18 new girls are admitted in the school, find how many new boys may be admitted so that the ratio of the number of boys to the number of girls may change to 2 : 3.
a) 42 b) 50
c) 45 d) none of these

32. In a department, the number of males and females are in the ratio 3 : 2. If two males and 5 females join department, then the ratio becomes 1 : 1, initially the number of female in the department is:
a) 9 b) 6
c) 3 d) 8

33. The ratio of the prices of two houses was 16 : 23. Two years later when the price of the first has increased by 10% and that of the second by Rs.477, the ratio of the prices becomes 11 : 20. Find the original prices of the second houses.
a) Rs.1,219 b) Rs.1,222
c) Rs.1,225 d) none of these

34. A bag has 105 coins containing some 50 paise, and 25 paise coins. The ratio of the number of these coins is 4 : 3. The total value (in Rs.) in the bag is

a) 43.25   b) 41.25

c) 39.25   d) 35.25

35. A box contains Rs.56 in the form of coins of one rupee, 50 paise and 25 paise. The number of 50 paise coin is double the number of 25 paise coins and four times the numbers of one rupee coins. The numbers of 50 paise coins in the box is: *(Scanner)*
a) 64   b) 32
c) 16   d) 14

36. A bag contains Rs.187 in the form of 1 rupee, 50 paise and 10 paise coins in the ratio 3:4:5. Find the number of each type of coins: *(Scanner)*
a) 102, 136, 170   b) 136, 102, 170
c) 170, 102, 136   d) None.

37. The first, second and third month salaries of a person are in the ratio 2 : 4 : 5. The difference between the product of the salaries of first 2 months & last 2 months is 4,80,00,000. Find the salary of the second month.
a) Rs. 4,000   b) Rs. 6,000
c) Rs. 12,000   d) Rs. 8,000

38. X, Y, Z together starts a business. If X invests 3 times as much as Y invests and Y invests two third of what Z invests, then the ratio of capitals of X, Y, Z is: *(Scanner)*
a) 3:9:2   b) 6:3:2
c) 3:6:2   d) 6:2:3

39. The ratio in which the total wages of the workers of a factory get increased (or decreased), if there be a reduction of workers in the ratio 7 : 5 and an increase in their wages in the ratio 2:3 is
a) 14 : 15   b) 15 : 14
c) 4 : 1   d) 1 : 4

40. Find in what ratio will the total wages of the workers of a factory be increased or decreased if there be a reduction in the number of workers in the ratio 15 : 11 and an increment in their wages in the ratio 22 : 25.

a) Increased in 5 : 8   b) Decreased in 6 : 5

c) Increased in 6 : 5   d) none of these

41. If $(a + b) : (b + c) : (c + a) = 6 : 7 : 8$ and $(a + b + c) = 14$, then the value of c is
a) 6   b) 7
c) 8   d) 14

42. If $p : q$ is the sub-duplicate ratio of $p - x^2 : q - x^2$ then x^2 is
a) $\dfrac{p}{p+q}$ b) $\dfrac{q}{p+q}$
c) $\dfrac{pq}{p+q}$ d) none of these

43. If $2s : 3t$ is the duplicate ratio of $2s – p : 3t – p$ then
a) $p^2 = 6st$ b) $p = 6st$
c) $2p = 3st$ d) none of these

44. If $(4x + 3) : (9x + 10)$ is the Triplicate Ratio of 3 : 4, then the value of x is
a) 9   b) 7
c) 6   d) 5

45. $\dfrac{3x-2}{5x+6}$ is the duplicate ratio of $\dfrac{2}{3}$ then find the value of x :
a) 2   b) 6
c) 5   d) 9

46. What quantity must be added to the terms of the ratio $p+q : p – q$ to make it equal to $(p + q)^2 : (p – q)^2$
a) $(q + p) / 2p$ b) $(q – p) / 2p$
c) $(q^2 - p^2)/2p$ d) None of these

Proportions

A.   Features of proportion :

1.   Equality of two ratio is called a proportion.

2.   a, b, c, d are the terms of the proportion.

(1)   a and d are the Extremes or extreme terms.

(2) b and c are the means or mean terms.

3.   **Cross product rule :** Product of extremes = product of means

4.   **Continuous proportion :** Quantities are said to be in continuous proportion if

$$\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = \frac{d}{e} = \ldots\ldots$$

B.   Terminologies :

1.   If a, b, c are in continued proportion, then $\frac{a}{b} = \frac{b}{c}$,

(a)   Mean proportional b is the mean proportional between a and c i.e. $b^2 = ac \Rightarrow b = \sqrt{ac}$

(b) First proportional $\Rightarrow$ a is the first proportional.

(c) Third proportional $\Rightarrow$ c is the third proportional.

2.   Fourth Proportional $\Rightarrow$ If a, b, c, d are in proportion, then d is the fourth proportional.

C.   Properties of proportion – If a:b = c: d

Property	Result
1. Invertendo	b:a = d:c
2. Alternendo	a : c = b : d
3. Componedo	(a+b) : b = (c + d) : d
4. Dividendo	(a-b) : b = (c – d) : d
5. Componendo and Dividendo	(a+b) : (a-b) = (c +d) : (c – d)

If $\frac{a}{b} = \frac{c}{d}$ then, (Theorem on equal ratios)

6) Addendo $\frac{a}{b} = \frac{c}{a} = \frac{a+c}{b+a}$

Part - II
Proportion
Set - A

1. Which of the numbers are not in proportion? *(Scanner)*
   a) 6, 8, 5, 7
   b) 7, 3, 14, 6
   c) 18, 27, 12, 18
   d) 8, 6, 12, 9

2. Find the value of x if 10/3 : x : : 5/2 : 5/4.
   a) 5/3
   b) 5/2
   c) 5/5
   d) none of these

3. If $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$ and $\frac{1}{x}$ are in proportion, then the value of 'x' will be: *(Scanner)*
   a) $\frac{15}{2}$
   b) $\frac{6}{5}$
   c) $\frac{10}{3}$
   d) $\frac{5}{6}$

4. Find the fourth proportional to 2/3, 3/7, 4.
   a) 15/7
   b) 18/7
   c) 16/7
   d) none of these

5. Fourth proportional to x, 2x, (x+1) is: *(Scanner)*
   a) (x + 2)
   b) (x – 2)
   c) (2x + 2)
   d) (2x – 2)

6. Find the third proportion to 2.4 Kg, 9.6 kg.
   a) 38.4
   b) 35.4
   c) 33.5
   d) none of these

7. The fourth proportional to 4, 6, 8 is
   a) 12
   b) 32
   c) 48
   d) none of these

8. 12, 16, *, 20 are in proportion. Then * is
   a) 25
   b) 14
   c) 15
   d) none of these

9. 4, *, 9, 13½ are in proportion. Then * is
   a) 6
   b) 8
   c) 9
   d) none of these

10. The third proportional to 12, 18 is

   a) 24
   b) 27
   c) 36
   d) none of these

11. The third proportional between $(a^2 – b^2)$ and $(a + b)^2$ is: *(Scanner)*
    a) $\frac{a+b}{a-b}$
    b) $\frac{a-b}{a+b}$
    c) $\frac{(a-b)^2}{a+b}$
    d) $\frac{(a+b)^3}{a-b}$

12. Find the mean proportion between 1.25 and 1.8.
    a) 1.1
    b) 1.5
    c) 1.2
    d) none of these

13. The mean proportional between 25, 81 is
    a) 40
    b) 50
    c) 45
    d) none of these

14. The mean proportional between 1.4 gms and 5.6 gms is
    a) 28 gms
    b) 2.8 gms
    c) 3.2 gms
    d) none of these

15. The mean proportional between 24 and 54 is: *(Scanner)*
    a) 33
    b) 34
    c) 35
    d) 36

16. The number which has the same ratio to 26 that 6 has to 13 is
    a) 11
    b) 10
    c) 21
    d) none of these

17. The fourth proportional to 2a, a^2, c is
    a) ac/2
    b) ac
    c) 2/ac
    d) none of these

18. If four numbers 1/2, 1/3, 1/5, 1/x are proportional then x is
    a) 6/5
    b) 5/6
    c) 15/2
    d) none of these

19. The mean proportional between $12x^2$ and $27y^2$ is
    a) 18xy
    b) 81xy
    c) 8xy
    d) none of these

20. If A = B/2 = C/5, then A : B : C is
    a) 3 : 5 :2
    b) 2 : 5 : 3
    c) 1 : 2 : 5
    d) none of these

21. If a/3 = b/4 = c/7, then (a + b + c)/c is
    a) 1
    b) 3
    c) 2
    d) none of these

22. If $\dfrac{a}{4}=\dfrac{b}{5}=\dfrac{c}{9}$ then $\dfrac{a+b+c}{c}$ is
    a) 4
    b) 2
    c) 7
    d) none of these

23. If $\dfrac{a}{3}=\dfrac{b}{4}=\dfrac{c}{7}$, then prove that $\dfrac{a+b+c}{c}=2$
    a) 1
    b) 2
    c) 8
    d) 5

24. If x/2 = y/3 = z/7, then the value of (2x – 5y + 4z)/2y is
    a) 6/23
    b) 23/6
    c) 3/2
    d) 17/6

25. If x : y : z = 7 : 4 : 11 the $\dfrac{x+y+z}{z}$ is:
    (Scanner)
    a) 2   b) 3   c) 4   d) 5

26. If p/q = r/s = 2.5/1.5, the value of ps : qr is
    a) 3/5
    b) 1 : 1
    c) 5/3
    d) none of these

27. If x : y = z : w = 2.5 : 1.5, the value of (x + z) / (y + w) is
    a) 1
    b) 3/5
    c) 5/3
    d) none of these

28. If (5x – 3y) /(5y – 3x) = 3/4, the value of x : y is
    a) 2 : 9
    b) 7 : 2
    c) 7 : 9
    d) none of these

29. If A : B = 3 : 2 and B : C = 3 : 5, then A : B : C is
    a) 9 : 6 : 10
    b) 6 : 9 : 10
    c) 10 : 9 : 6
    d) none of these

30. If x : y = 2 : 3, y : z = 4 : 3 then x : y : z is
    a) 2 : 3 : 4
    b) 4 : 3 : 2
    c) 3 : 2 : 4
    d) none of these

31. If 2A = 3 B and 4B = 5C, then A : C is
    a) 4 : 3
    b) 15 : 8
    c) 8 : 15
    d) 3 : 4

32. If a : b = 2 : 3, b : c = 4 : 5 and c : d = 6 : 7, then a : d is: *(Scanner)*
    a) 24 : 35
    b) 8 : 15
    c) 16 : 35
    d) 7 : 15

33. P, Q and R are three cities. The ratio of average temperature between P and Q is 11 : 12 and that between P and R is 9 : 8. The ratio between the average temperature of Q and R is:
    (Scanner)
    a) 22 : 27
    b) 27 : 22
    c) 32 : 33
    d) None

34. If A : B = 5 : 3 B : C = 6 : 7 and C : D = 4 : 9, then the value of A : B : C : D
    a) 20 : 14 : 12 : 9
    b) 20 : 9: 12 : 14
    c) 20 : 9 : 14 : 12
    d) 40 : 14 : 28 : 63

35. Division of Rs.750 into 3 parts in the ratio 4 : 5 : 6 is
    a) (200, 250, 300)
    b) (250, 250, 250)
    c) (350, 250, 150)
    d) 8 : 12 : 9

36. The numbers 14, 16, 35, 42 are not in proportion. The fourth term for which they will be in proportion is
    a) 45
    b) 40
    c) 32
    d) none of these

37. If x/y = z/w, implies y/x = w/z, then the process is called
    a) Dividend
    b) Componendo
    c) Alternendo
    d) none of these

38. If p/q = r/s = p-r/q – s, the process is called
    a) Subtrahendo
    b) Addendo
    c) Invertendo
    d) none of these

39. If a/b = c/d, implies (a+b)/(a-b) = (c + d)/(c – d), the process is called
    a) Componendo
    b) Dividendo

c) Componendo and Dividendo
d) none of these

40. If u/v = w /p, then (u-v)/(u+v) = (w-p)/(w+p). The process is called
a) Invertendo
b) Alternendo
c) Addendo
d) none of these

41. Two numbers are in the ratio 3 : 4; if 6 be added to each terms of the ratio, then the new ratio will be 4 :5, then the numbers are
a) 14, 20　　　　　　　b) 17, 19
c) 18 and 24　　　　　d) none of these

42. What number must be added to each of the numbers 10, 18, 22, 38 to make the numbers is proportion?　　　　　　　　*(Scanner)*
a) 2　　　　　　　　　b) 4
c) 8　　　　　　　　　d) None of these

43. If $\dfrac{a}{4} = \dfrac{b}{5}$ then

a) $\dfrac{a+4}{a-4} = \dfrac{b-5}{b+5}$

b) $\dfrac{a+4}{a-4} = \dfrac{b+5}{b-5}$

c) $\dfrac{a-4}{a+4} = \dfrac{b+5}{b-5}$

d) none of these

44. If a : b = 4 : 1 then $\sqrt{\dfrac{a}{b}} + \sqrt{\dfrac{b}{a}}$ is

a) 5/2
b) 4
c) 5
d) none of these

45. If a : b = 9 : 4 then $\sqrt{\dfrac{a}{b}} + \sqrt{\dfrac{b}{a}}$ = ?

a) 2/ 3　　　　　b) 3/2
c) 6/13　　　　　d) 13/6

46. If a : b = c : d = 2.5 : 1.5, what are the values of ad : bc ?
a) 1 : 5
b) 1 : 1

c) 1 : 3
d) 1 : 2

47. If a : b = c : d = 2.5 : 1.5, what are the values of a + c : b + d?
a) 5 : 3
b) 5 : 5
c) 5 : 1
d) none of these

Set - B

1. The sum of the ages of 3 persons is 150 years. 10 years ago their ages were in the ratio 7 : 8 : 9. Their present ages are
a) (45, 50, 55)　　　　b) (40, 60, 50)
c) (35, 45, 70)
d) none of these

2. 20 litres of a mixture contains milk and water in the ratio 5:3. If 4 litres of this mixture be replaced by 4 litres of milk, the ratio of milk to water in the new mixture would be
a) 2 :1　　　　　　　b) 7 : 3
c) 8 : 3　　　　　　　d) 4 : 3

3. If $\dfrac{x}{b+c-a} = \dfrac{y}{c+a-b} = \dfrac{z}{a+b-c}$ then (b − c) x + (c − a)y + (a − b)z is
a) 1
b) 0
c) 5
d) none of these

Set - C

1. A dealer mixes tea costing Rs.6.92 per kg. with tea costing Rs.7.77 per kg and sells the mixture at Rs.8.80 per kg and earns a profit of $17\dfrac{1}{2}$% on his sale price. In what proportion does he mix them?
a) 3 : 2
b) 2 : 2
c) 2 : 3
d) none of these

Indices

Definition of Indices :

The product of m factors each equal to a represented by am. So, am = a. a. a……. a (m times). Here a is called the base and m is the index (or power or exponent).

Properties of Indices :

1. $a^m . a^n = a^{m+n}$
2. $\dfrac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $a^0 = 1$
5. $1^x = 1.$
6. $\sqrt[m]{a} = a^{\frac{1}{m}}$
7. $a^n\, b^n = (ab)^n$
8. $\dfrac{a^m}{b^m} = \left(\dfrac{a}{b}\right)^m$
9. $a^{-m} = \dfrac{1}{a^m}$
10. $\dfrac{1}{a^{-m}} = a^m$
11. $\left(\dfrac{a}{b}\right)^{-m} = \left(\dfrac{b}{a}\right)^m$
12. $a^{\frac{p}{q}} = (a^p)^{\frac{1}{q}} = \sqrt[q]{a^p}$

Part - III
Indices
Set - A

1. $4x^{-1/4}$ is expressed as
   a) $-4x^{1/4}$
   b) x^{-1}
   c) $4/x^{1/4}$
   d) none of these

2. The value of $8^{1/3}$ is
   a) $^3\sqrt{2}$
   b) 4
   c) 2
   d) none of these

3. The value of $2 \times (32)^{1/5}$ is
   a) 2
   b) 10
   c) 4
   d) none of these

4. The value of $4/(32)^{1/5}$ is
   a) 8
   b) 2
   c) 4
   d) none of these

5. The value of $(8/27)^{1/3}$ is
   a) 2/3
   b) 3/2
   c) 2/9
   d) none of these

6. The value of $2(256)^{-1/8}$ is
   a) 1
   b) 2
   c) 1/2
   d) none of these

7. $\left(\dfrac{\sqrt{3}}{9}\right)^{5/2}\left(\dfrac{9}{3\sqrt{3}}\right)^{7/2}\times 9$ is equal to: *(Scanner)*
   a) 1
   b) $\sqrt{3}$
   c) $3\sqrt{3}$
   d) $\dfrac{3}{9\sqrt{3}}$

8. $2^{\frac{1}{2}} \cdot 4^{\frac{3}{4}}$ is equal to
   a) a fraction
   b) a positive integer
   c) a negative integer
   d) none of these

9. $\left(\dfrac{81x^4}{y^{-8}}\right)^{\frac{1}{4}}$ has simplified value equal to
   a) xy^2
   b) x^2y
   c) $9xy^2$
   d) none of these

10. The value of $\left(\dfrac{2p^2q^3}{3xy}\right)^0$ where p, q, x, y $\neq$ 0 is equal to
    a) 0
    b) 2/3
    c) 1
    d) none of these

11. Which is True?
    a) $2^0 > (1/2)^0$
    b) $2^0 < (1/2)^0$
    c) $2^0 = (1/2)^0$
    d) none of these

12. Simplify $(6ab^2c^3) (4b^{-2}c^{-3}d\cdot)$
    a) 24ad
    b) 30ad
    c) 48ad
    d) none of these

13. Find the value of $\dfrac{4x^{-1}}{x^{-1/3}}$
    a) $4x^{-2/3}$ or $\dfrac{4}{x^{2/3}}$
    b) $4x^{-3/2}$ or $\dfrac{4}{x^{2/3}}$
    c) $4x^{-2/3}$ or $\dfrac{x^{2/3}}{4}$
    d) none of these

14. $x^{a-b}\, x^{b-c}\, x^{c-a}$ is equal to
    a) x
    b) 1
    c) 0
    d) none of these

15. The value of $\left[(10)^{150} \div (10)^{146}\right]$ is
    a) 1000
    b) 10000
    c) 100000
    d) 10^6

16. Simplify $2x^{1/2}\, 3x^{-1}$ if x = 4
    a) 5
    b) 15
    c) 3
    d) none of these

17. $4^{2.5} : 2^3$ is same as
    a) 4 : 1
    b) 2 : 1
    c) 16 : 1
    d) 80 : 1

18. Simplification of $\dfrac{x^{m+3n}\cdot x^{4m-9n}}{x^{6m-6n}}$ is: *(Scanner)*
    a) x^m
    b) x^{-m}
    c) x^n
    d) x^{-n}

19. Solve for x if $(\sqrt{x})^{\sqrt{x}} = 256$
   - a) 2
   - b) 16
   - c) 4
   - d) $\sqrt{2}$

20. Find the value of x, if $x(x)^{1/3} = (x^{1/3})^x$
   (Scanner)
   - a) 3
   - b) 4
   - c) 2
   - d) 6

21. Find thew value of 'a' from the following
   $$(\sqrt{9})^{-5} \times (\sqrt{3})^{-7} = (\sqrt{3})^{-a}$$
   - a) 13
   - b) 11
   - c) 15
   - d) 17

22. If $2^x \times 3^y \times 5^z = 360$ Then what is the value of x, y, z,?
   (Scanner)
   - a) 3, 2, 1
   - b) 1, 2, 3
   - c) 2, 3, 1
   - d) 1, 3, 2

23. Solve for 'z' if $z^{-1} = 3^{-1} - 4^{-1}$
   - a) 5^{-1}
   - b) 1
   - c) 1/12
   - d) 12

24. If 49 x 49 x 49 x 49 = 7^n, then n equals
   - a) 4
   - b) 7
   - c) 8
   - d) 16

25. Simplify $\dfrac{2a^{\frac{1}{2}} \times a^{\frac{2}{3}} \times 6a^{-\frac{7}{3}}}{9a^{-\frac{5}{3}} \times a^{\frac{3}{2}}}$ if a = 4
   - a) $\dfrac{1}{2}$
   - b) $\dfrac{1}{3}$
   - c) $\dfrac{1}{4}$
   - d) none of these

26. Find x, if $x\sqrt{x} = (x\sqrt{x})^x$
   - a) x = 2
   - b) x = 3
   - c) x = 1
   - d) none of these

Set - B

1. The value of $y^{a-b} \times y^{b-c} \times y^{c-a} \times y^{-a-b}$ is
   - a) y^{a+b}
   - b) y
   - c) 1
   - d) $1/y^{a+b}$

2. Simplify $(x^a . y^{-b})^3 . (x^3 y^2)^{-a}$
   - a) $\dfrac{1}{y^{3b+2a}}$
   - b) $\dfrac{1}{y^{3b-2a}}$
   - c) $\dfrac{1}{y^{2b-3a}}$
   - d) $\dfrac{1}{y^{2b+3a}}$

3. The True option is
   - a) $x^{2/3} = \sqrt[3]{x^2}$
   - b) $x^{2/3} = \sqrt[3]{x^3}$
   - c) $x^{2/3} > \sqrt[3]{x^2}$
   - d) $x^{2/3} < \sqrt[3]{x^2}$

4. For what minimum integer value of x, the expression $(3^x / 243)$ will be greater than 1?
   - a) 3
   - b) 4
   - c) 5
   - d) 6

5. The simplified value of $(16x^{-3}y^2)(8^{-1}x^3y^{-2})$ is
   - a) 2xy
   - b) xy/2
   - c) 2
   - d) none of these

6. The value of $(8/27)^{-1/3} \times (32/243)^{-1/5}$ is
   - a) 9/4
   - b) 4/9
   - c) 2/3
   - d) none of these

7. The value of $\dfrac{x^{2/7}}{z^{-1/2}} \times \dfrac{x^{2/5}}{z^{2/3}} \times \dfrac{x^{-9/7}}{z^{2/3}} \times \dfrac{z^{5/6}}{x^{-3/5}}$ is
   - a) 1
   - b) -1
   - c) 0
   - d) None

8. The value of $\left(\dfrac{6^{-1}7^2}{6^27^{-4}}\right)^{7/2} \times \left(\dfrac{6^{-2}7^3}{6^37^{-5}}\right)^{-5/2}$ is
   - a) 0
   - b) 252
   - c) 250
   - d) 248

9. If $3^{(x-y)} = 27$ and $3^{(x+y)} = 243$, then x is equal to –
   - a) 0
   - b) 2
   - c) 4
   - d) 6

10. If $\left(\dfrac{3a}{2b}\right)^{2x-4} = \left(\dfrac{2b}{3a}\right)^{2x-4}$ for same a and b, then the value of x is
   - a) 8
   - b) 6
   - c) 4
   - d) 2

11. The value of $\dfrac{6^{x+4}+3^{x+2}.2^{x+3}}{5 \times 6^x + 6^x}$

    a) 232   b) 242
    c) 252   d) 262

12. Find the value of k from $(\sqrt{9})^{-7} \times (\sqrt{3})^{-5} = 3^k$

    a) -19/2   b) 19/2
    c) +19/2   d) none of these

13. $\sqrt[6]{a^{4b}x^6} \cdot (a^{2/3}x^{-1})^{-b}$

    a) x^{1-b} b) x^{1+b}
    c) x^{b-1} d) none of these

14. On simplification $\dfrac{2^{x+3} \times 3^{2x-y} \times 5^{x+y+3} \times 6^{y+1}}{6^{x+1} \times 10^{y+3} \times 15^x}$

    reduces to

    a) -1   b) 0
    c) 1   d) 10

15. $\dfrac{2^{m+1} \times 3^{2m-n+3} \times 5^{n+m+4} \times 6^{2n+m}}{6^{2m+n} \times 10^{n+1} \times 15^{m+3}}$ **(Scanner)**

    a) 3^{2m-2n} b) 3^{2n-2m}
    c) 1   d) None of the above

16. $\{(3^3)^2 \times (4^2)^3 \times (5^3)^2\} / \{(3^2)^3 \times (4^3)^2 \times (5^2)^3\}$ is

    a) 3/4   b) 4/5
    c) 4/7   d) 1

17. If $(25)^{150} = (25x)^{50}$; then the value of x will be:

(Scanner)

    a) 5^3 b) 5^4
    c) 5^2 d) 5

18. $[\{(2)^{1/2} \cdot (4)^{3/4} \cdot (8)^{5/6} \cdot (16)^{7/8} \cdot (32)^{9/10}\}^4]^{3/25}$ is

    a) A fraction   b) an integer
    c) 1   d) none of these

19. Simplified value of $(125)^{2/3} \times \sqrt{25} \times \sqrt[3]{5^3} \times 5^{1/2}$ is

    a) 5   b) 1/5
    c) 1   d) none of these

20. The value of $\left(1 - \sqrt[3]{0.027}\ \left(\tfrac{5}{6}\right)\left(\tfrac{1}{2}\right)^2\right)$ is

    a) 11/16   b) 13/16
    c) 15/16   d) 1

21. The value of $\{(x + y)^{2/3} (x - y)^{3/2} / \sqrt{x+y} \times \sqrt{(x - y)^3}\}^6$ is

    a) $(x + y)^2$ b) $(x - y)$
    c) $x + y$ d) none of these

22. The value of $\dfrac{1}{1+a^{y-x}} + \dfrac{1}{1+a^{x-y}}$ is given by

    a) -1   b) 0
    c) 1   d) None

23. If $x^{1/p} = y^{1/q} = z^{1/r}$ and xyz = 1, then the value of p +q + r is

    a) 1   b) 0
    c) 1/2   d) none of these

24. If $a^x = b$, $b^y = c$, $c^z = a$, then xyz is

    a) 1   b) 2
    c) 3   d) none of these

25. If $x = y^a$, $y = z^b$ and $z = x^c$ then abc is:

(Scanner)

    a) 2   b) 1   c) 3   d) 4

26. The value of z is given by the following if $z^{z\sqrt{z}} = \left(z\sqrt{z}\right)^z$

    a) 2   b) $\dfrac{3}{2}$
    c) $-\dfrac{3}{2}$ d) $\dfrac{9}{4}$

27. If $2^x - 2^{x-1} = 4$ then x^x is equal to: **(Scanner)**

    a) 7   b) 3
    c) 27   d) 9

28. $\dfrac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$ **(Scanner)**

    a) ½   b) 3/2
    c) 2/3   d) 1/3

29. The value of $\dfrac{\left(3^{n+1}+3^n\right)}{\left(3^{n+3}-3^{n+1}\right)}$ is equal to:

(Scanner)

    a) 1/5   b) 1/6
    c) 1/4   d) 1/9

Set - C

1. The value of $\left(\dfrac{x^a}{x^b}\right)^{a+b} \times \left(\dfrac{x^b}{x^c}\right)^{b+c} \times \left(\dfrac{x^c}{x^a}\right)^{c+a}$

   a) 1   b) 0
   c) 2   d) none of these

2. Show that $\left(\dfrac{x^b}{x^c}\right)^a \times \left(\dfrac{x^c}{x^a}\right)^b \times \left(\dfrac{x^a}{x^b}\right)^c$ reduces to

   a) 1   b) 3
   c) 0   d) 2

3. Show that $\left(\dfrac{x^b}{x^c}\right)^{1/bc} \times \left(\dfrac{x^c}{x^a}\right)^{1/ca} \times \left(\dfrac{x^a}{x^b}\right)^{1/ab}$ reduces to

   a) -1   b) 0
   c) 1   d) None

4. Show that $\sqrt[(a+b)]{\dfrac{x^{a^2}}{x^{b^2}}} \times \sqrt[(b+c)]{\dfrac{x^{b^2}}{x^{c^2}}} \times \sqrt[(c+a)]{\dfrac{x^{c^2}}{x^{a^2}}}$ reduces to

   a) 1   b) 0
   c) -1   d) None

5. $\left(\dfrac{x^b}{x^c}\right)^{b+c-a} \times \left(\dfrac{x^c}{x^a}\right)^{c+a-b} \times \left(\dfrac{x^a}{x^b}\right)^{a+b-c}$ is given by

   a) 1   b) 0
   c) -1   d) None

6. The simplified form of
   $$\left[\dfrac{x^L}{x^m}\right]^{l^2+lm+m^2} \times \left[\dfrac{x^m}{x^n}\right]^{m^2+mn+n^2} \times \left[\dfrac{x^n}{x^l}\right]^{l^2+Ln+n^2}$$

   a) 0   b) 1
   c) x   d) none of these

7. The value of
   $$\left(\dfrac{x^a}{x^b}\right)^{(a^2+ab+b^2)} \times \left(\dfrac{x^b}{x^c}\right)^{(b^2+bc+c^2)} \times \left(\dfrac{x^c}{x^a}\right)^{(c^2+ca+a^2)}$$
   (Scanner)

   a) 1   b) 0
   c) -1   d) none of these

8. $\left(\dfrac{x^a}{x^{-b}}\right)^{a^2-ab+b^2} \times \left(\dfrac{x^b}{x^{-c}}\right)^{b^2-bc+c^2} \times \left(\dfrac{x^c}{x^{-a}}\right)^{c^2-ca+a^2}$ is reduces to

   a) 1   b) $x^{-2\left(a^2+b^2+c^2\right)}$
   c) $x^{2\left(a^3+b^3+c^3\right)}$ d) $x^{-2\left(a^3+b^3+c^3\right)}$

9. Show that $\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}} \times \left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}} \times \left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}}$ is given by

   a) 1   b) -1
   c) 3   d) 0

10. Show that $\left(x^{\frac{b+c}{c-a}}\right)^{\frac{1}{a-b}} \times \left(x^{\frac{c+a}{a-b}}\right)^{\frac{1}{b-c}} \times \left(x^{\frac{a+b}{b-c}}\right)^{\frac{1}{c-a}}$ reduces to

    a) 1   b) 3
    c) -1   d) None

11. On simplification
    $$\left[\dfrac{x^{ab}}{x^{a^2+b^2}}\right]^{a+b}\left[\dfrac{x^{b^2+c^2}}{x^{bc}}\right]^{b+c} \times \left[\dfrac{x^{ca}}{x^{c^2+a^2}}\right]^{c+a}$$ reduces to

    a) x^{-2a^3} b) x^{2a^3}
    c) $x^{-2\left(a^3+b^3+c^3\right)}$ d) $x^{2\left(a^3+b^3+c^3\right)}$

12. On simplification
    $$\left[\dfrac{x^{ab}}{x^{a^2+b^2}}\right]^{a+b}\left[\dfrac{x^{bc}}{x^{b^2+c^2}}\right]^{b+c} \times \left[\dfrac{x^{ca}}{x^{c^2+a^2}}\right]^{c+a}$$ reduces to

    a) x^{-2a^3} b) x^{2a^3}
    c) $x^{-2\left(a^3+b^3+c^3\right)}$ d) $x^{2\left(a^3+b^3+c^3\right)}$

13. On simplification $\left[\dfrac{x^{\frac{a}{a-b}}}{x^{\frac{a}{a+b}}} \div \dfrac{x^{\frac{b}{b-a}}}{x^{\frac{b}{b+a}}}\right]^{a+b}$ reduces to

    a) 1   b) -1
    c) 0   d) None

14. Value of $(a^{1/8} + a^{-1/8})(a^{1/8} - a^{-1/8})(a^{1/4} + a^{-1/4})(a^{1/2} + a^{-1/2})$ is: *(Scanner)*

    a) $a + \dfrac{1}{a}$ b) $a - \dfrac{1}{a}$
    c) $a^2 + \dfrac{1}{a^2}$ d) $a^2 - \dfrac{1}{a^2}$

15. The value of

$$\left[\frac{x^2-(y-z)^2}{(x+z)^2-y^2}+\frac{y^2-(x-z)^2}{(x+y)^2-z^2}+\frac{z^2-(x-y)^2}{(y+z)^2-x^2}\right]$$

is   *(Scanner)*

a) 0   b) 1

c) - 1   d) ∞

16. Tick the correct of these when x = $p^{1/3} - p^{-1/3}$

a) $x^3+3x = p + 1/p$

b) $x^3 + 3x = p - 1/p$

c) $x^3 + 3x = p + 1$

d) none of these

17. If P = $x^{1/3} + x^{-1/3}$ then $P^3 - 3P$ =   *(Scanner)*

a) 3   b) $\dfrac{1}{2}\left(x+\dfrac{1}{x}\right)$

c) $\left(x+\dfrac{1}{x}\right)$ d) $2\left(x+\dfrac{1}{x}\right)$

18. If a = $x^{1/3} + x^{-1/3}$ then a^3-3a is

a) $x + x^{-1}$ b) $x - x^{-1}$

c) 2x   d) 0

19. If $x = 3^{\frac{1}{3}} + 3^{-\frac{1}{3}}$, then $3x^3 - 9x$ is

a) 15   b) 10

c) 12   d) none of these

20. If x = $4^{1/3} + 4^{-1/3}$ then $4x^3 - 12x$ is given by

a) 12   b) 13

c) 15   d) 17

21. If x = $5^{1/3} + 5^{-1/3}$ then $5x^3 - 15x$ is given by

a) 25   b) 26

c) 27   d) 30

22. If $a = \sqrt[3]{\sqrt{2}+1}-\sqrt[3]{\sqrt{2}-1}$ then the value of a^3 + 3a-2 is

a) 3   b) 0

c) 2   d) 1

23. If a = $3^{1/4} + 3^{-1/4}$ and b = $3^{1/4} - 3^{-1/4}$ then the value of $3(a^2 + b^2)^2$ is

a) 67   b) 65

c) 64   d) 62

24. If $x=\sqrt{3}+\dfrac{1}{\sqrt{3}}$ and $y=\sqrt{3}-\dfrac{1}{\sqrt{3}}$ then $x^2 - y^2$ is

a) 5   b) $\sqrt{3}$

c) $\dfrac{1}{\sqrt{3}}$ d) 4

25. $\left[\left(x^n\right)^{n-\frac{1}{n}}\right]^{\frac{1}{n+1}}$ is equal to

a) x^n

b) x^{n+1}

c) x^{n-1}

d) none of these

26. $[1-\{1-(1-x^2)^{-1}\}^{-1}]^{-1/2}$ is equal to

a) x   b) 1/x

c) 1   d) none of these

27. On simplification $\left(\dfrac{m^x}{m^y}\right)^{x+y}\times\left(\dfrac{m^y}{m^z}\right)^{y+z}$

$\div 3(m^x m^z)^{x-z}$ reduces to

a) 3   b) -3

c) $-\dfrac{1}{3}$ d) $\dfrac{1}{3}$

28. Show that $\dfrac{16(32)^x - 2^{3x-2}.4^{x+1}}{15(2)^{x-1}(16)^x} - \dfrac{5(5)^{x-1}}{\sqrt{5^{2x}}}$ is given

by

a) 1   b) -1

c) 4   d) 0

29. If $\dfrac{9^y.3^2.\left(3^{-y}\right)^{-1}-27^y}{3^{3x}.2^3}=\dfrac{1}{27}$ then x – y is given by

a) -1   b) 1

c) 0   d) None

30. If m = b^x, n = b^y and $(m^y n^x) = b^2$ the value of xy is given by

a) -1   b) 0

c) 1   d) None

31. If a = xy^{m-1} b = xy^{n-1}, c = xy^{p-1} then the value of $a^{n-p} \times b^{p-m} \times c^{m-n}$ reduces to

a) 1   b) -1

c) 0   d) None

32. If $a = x^{n+p} y^m$, $b = x^{p+m} y^n$, $c = x^{m+n} y^p$ then the value of $a^{n-p} \times b^{p-m} \times c^{m-n}$ reduces to
   a) 0
   b) 1
   c) -1
   d) None

33. If $a^b = b^a$, then the value of $\left(\dfrac{a}{b}\right)^{\frac{a}{b}} - a^{\frac{a}{b}-1}$ reduces to
   a) a
   b) b
   c) 0
   d) None

34. If $a^p = b^q = c^r$ and $b^2 = ac$ the value of $q(p+r)/pr$ is given by
   a) 1
   b) -1
   c) 2
   d) None

35. If $2^x = 3^y = 6^{-z}$, $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$ is
   a) 1
   b) 0
   c) 2
   d) none of these

36. If $4^x = 5^y = 20^z$ then z is equal to:
   (Scanner)
   a) xy
   b) $\dfrac{x+y}{xy}$
   c) $\dfrac{1}{xy}$
   d) $\dfrac{xy}{x+y}$

37. If $(5.678)^x = (0.5678)^y = 10^z$ then
   a) $\dfrac{1}{x} - \dfrac{1}{y} + \dfrac{1}{z} = 1$
   b) $\dfrac{1}{x} - \dfrac{1}{y} - \dfrac{1}{z} = 0$
   c) $\dfrac{1}{x} - \dfrac{1}{y} + \dfrac{1}{z} = -1$
   d) None

38. If $(4.8)^x = (0.48)^y = 1{,}000$ then the value of $\dfrac{1}{x} - \dfrac{1}{y}$ is
   a) 3
   b) -3
   c) $\dfrac{1}{3}$
   d) $-\dfrac{1}{3}$

39. If $2^a = 3^b = (12)^c$, then $\dfrac{1}{c} - \dfrac{1}{b} - \dfrac{2}{a}$ reduces to
   a) 1
   b) 0
   c) 2
   d) None

40. If $2^a = 3^b = (12)^c$, then the value of ab-c (a+2b) reduces to
   a) 0
   b) 1
   c) 2
   d) 3

41. If $3^x = 5^y = 75^z$, then   *(Scanner)*
   a) $x + y - z = 0$
   b) $\dfrac{2}{x} + \dfrac{1}{y} = \dfrac{1}{z}$
   c) $\dfrac{1}{x} + \dfrac{2}{y} = \dfrac{1}{z}$
   d) $\dfrac{2}{x} + \dfrac{1}{z} = \dfrac{1}{y}$

42. If $3^a = 5^b = (75)^c$, then the value of ab-c (2a+b) reduces to
   a) 1
   b) 0
   c) 3
   d) 5

43. If $a^p = b^q = c^r = d^s$ and $ab = cd$ then the value of $\dfrac{1}{p} + \dfrac{1}{q} - \dfrac{1}{r} - \dfrac{1}{s}$ reduces to
   a) 1/a
   b) 1/b
   c) 0
   d) 1

44. If $2^a = 4^b = 8^c$ and $abc = 288$ then the value $\dfrac{1}{2a} + \dfrac{1}{4b} + \dfrac{1}{8c}$ is given by
   a) $\dfrac{1}{8}$
   b) $-\dfrac{1}{8}$
   c) $\dfrac{11}{96}$
   d) $-\dfrac{11}{96}$

45. If $ax^{2/3} + bx^{1/3} + c = 0$ then the value of $a^3 x^2 + b^3 x + c^3$ is given by
   a) 3abcx
   b) -3abcx
   c) 3abc
   d) -3abc

46. $x^{a^2 b^{-1} c^{-1}} \cdot x^{b^2 c^{-1} a^{-1}} \cdot x^{c^2 a^{-1} b^{-1}} - x^3$ would reduce to zero if a + b + c is given by
   a) 1
   b) -1
   c) 0
   d) None

47. On simplification
$$\frac{1}{1+z^{a-b}+z^{a-c}} + \frac{1}{1+z^{b-c}+z^{b-a}} + \frac{1}{1+z^{c-a}+z^{c-b}}$$
   would reduces to
   a) $\dfrac{1}{z^{2(a+b+c)}}$
   b) $\dfrac{1}{z^{(a+b+c)}}$
   c) 1
   d) 0

48. On simplification, $1/(1+a^{m-n}+a^{m-p})$ + $1/(1+a^{n-m}+a^{n-p})$ + $1/(1+a^{p-m} + a^{p-n})$ is equal to
    a) 0   b) a
    c) 1   d) 1/a

49. If xyz = 1 then the value of $\frac{1}{1+x+y^{-1}}+\frac{1}{1+y+z^{-1}}+\frac{1}{1+z+x^{-1}}$ is
    a) 1   b) 0
    c) 2   d) None

50. If abc = 2, then the value of $\frac{1}{1+a+2b^{-1}}+\frac{1}{1+\frac{1}{2}b+c^{-1}}+\frac{1}{1+c+a^{-1}}$

    (Scanner)
    a) 1   b) 2
    c) 3   d) $\frac{1}{2}$

51. $\frac{1}{x^{b}+x^{-c}+1}+\frac{1}{x^{c}+x^{-a}+1}+\frac{1}{x^{a}+x^{-b}+1}$ would reduce to one if a + b + c is given by
    a) 1   b) 0
    c) -1   d) None

52. If $a=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}},b=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ then the value of a + b is
    a) 10   b) 100
    c) 98   d) 99

53. If $a=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}},b=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ then the value of a^2 + b^2 is
    a) 10
    b) 100
    c) 98
    d) 99

54. If $a=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}},b=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ then the value of $\frac{1}{a^2}+\frac{1}{b^2}$
    a) 10   b) 100
    c) 98   d) 99

55. The square root of $3+\sqrt{5}$ is
    a) $\sqrt{5/2}+\sqrt{1/2}$
    b) $-\left(\sqrt{5/2}+\sqrt{1/2}\right)$
    c) Both the above
    d) None

56. The square root of $11-\sqrt{120}$ is given by
    a) $\sqrt{6}+\sqrt{5}$
    b) $\sqrt{6}-\sqrt{5}$
    c) $2\sqrt{3}-3\sqrt{2}$
    d) $2\sqrt{3}+3\sqrt{2}$

57. The square root of $x+\sqrt{x^2-y^2}$ is given by
    a) $\frac{1}{\sqrt{2}}\left[\sqrt{x+y}+\sqrt{x-y}\right]$
    b) $\frac{1}{\sqrt{2}}\left[\sqrt{x+y}-\sqrt{x-y}\right]$
    c) $\left[\sqrt{x+y}+\sqrt{x-y}\right]$
    d) $\left[\sqrt{x+y}-\sqrt{x-y}\right]$

58. If $x=\sqrt{2-\sqrt{2-\sqrt{2}}}....\infty$ the value of x is given by
    a) -2   b) 1
    c) 2   d) 0

59. If a = $3 + 2\sqrt{2}$ then the value of $a^{1/2} + a^{-1/2}$ is
    a) $\sqrt{2}$ b) $-\sqrt{2}$
    c) $2\sqrt{2}$ d) $-2\sqrt{2}$

60. If a = $3+2\sqrt{2}$ then the value $a^{1/2}$ - $a^{-1/2}$ is
    a) $2\sqrt{2}$ b) 2
    c) $-2\sqrt{2}$ d) None

61. If a = $\frac{1}{2}(5-\sqrt{21})$ then the value of $a^3 + a^{-3} - 5a^2 - 5a^{-2} + a + a^{-1}$ is
    a) 0   b) 1
    c) 5   d) -1

62. If $a = 3 - \sqrt{5}$ then the value of $a^4 - a^3 - 20a^2 - 16a + 24$ is
    a) 10   b) 14
    c) 0   d) 15

Set - D

1. If $a = \dfrac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ then the value of $2a^4 - 21a^3 + 12a^2 - a + 1$ is
    a) 21   b) 1
    c) 12   d) None

2. If $a = \dfrac{4\sqrt{6}}{\sqrt{2} + \sqrt{3}}$ then the value of $\dfrac{a + 2\sqrt{2}}{a - 2\sqrt{2}} + \dfrac{a + 2\sqrt{3}}{a - 2\sqrt{3}}$ is given by
    a) 1   b) -1
    c) 2   d) -2

3. If $xy + yz + zx = -1$, then the value of $\left(\dfrac{x+y}{1+xy} + \dfrac{z+y}{1+zy} + \dfrac{x+z}{1+zx} \right)$ is
    a) xyz   b) $\dfrac{-1}{yz}$
    c) $\dfrac{1}{xyz}$ d) $\dfrac{1}{x+y+z}$

4. If $P + \sqrt{3}\,Q + \sqrt{5}\,R + \sqrt{15}\,S = \dfrac{1}{1 + \sqrt{3} + \sqrt{5}}$ then the value of P is
    a) 7/11   b) 3/11
    c) -1/11   d) -2/11

Logarithms

Logarithm of a number consists of two parts.

(a) The whole or integral parts is called characteristic.

(b) The decimal part is called mantissa.

   log(any number) = Characterstic. Mantissa

A) Indices to Log & Log to Indices conversions:

1) If $a^x = m$ then, $\log_a m = x$

2) If $\log_a m = x$ then $m = a^x$.

B) Laws of Logarithms.

1. $\log_c a + \log_c b = \log_c ab$

2. $\log_c a - \log_c b - \log_c \left(\dfrac{a}{b}\right)$

3. $\log a^m = m \log a$

   Please not $(\log a)^m \neq m \log a$

4. $\log_a a = 1$

5. $\log 1 = 0$

6. Change of Base : $\log_a b = \dfrac{\log a}{\log b}$

7. $\log_b a = \dfrac{1}{\log_a b}$

8. $\dfrac{1}{\log_b a} = \log_a b$

9. $a^{\log_a m} = m$.

Logarithm always has a base.

- The default base in general is '10'.

- But in calculas default base is 'e'.

e is constant e $\cong$ 2.71828

Calculus means Limits, continuity, derivatives, Integration and its applications.

Part - IV
Logarithms
Set - A

1. The integral part of a logarithm is called ____ and the decimal part of a logarithm is called____.   *(Scanner)*
   a) Mantissa, Characteristic
   b) Characteristic, Mantissa
   c) Whole, Decimal
   d) None of these.

2. log 6 + log 5 is expressed as
   a) log 11   b) log 30
   c) log 5/6   d) none of these

3. log 32/4 is equal to
   a) log 32/log 4   b) log 32 – log 4
   c) 2^3 d) none of these

4. log (1 × 2 × 3) is equal to
   a) log 1 + log 2 + log 3
   b) log 3
   c) log 2
   d) none of these

5. log 9 + log 5 is expressed as _____.
   a) log (9/5)   b) log 4
   c) log 14   d) log 45

6. $\log_2 8$ is equal to
   a) 2   b) 8
   c) 3   d) none of these

7. If 2 log x = 4 log 3, the x is equal to
   a) 3   b) 9
   c) 2   d) none of these

8. The value of $(\log_b a \times \log_c b \times \log_a c)^3$ is equal to
   a) 3   b) 0
   c) 1   d) none of these

9. The value of $(\log_y x . \log_z y . \log_x z)^3$ is   *(Scanner)*
   a) 1   b) – 1
   c) 1   d) 3

Set - B

1. $\log_{\sqrt{2}} 64$ is equal to
   a) 12   b) 6
   c) 1   d) none of these

2. Find the logarithm of 64 to the base $2\sqrt{2}$
   a) 6   b) 9
   c) 4   d) none of these

3. $\log_{2\sqrt{3}} 1728$ is equal to
   a) 2√3   b) 2
   c) 6   d) none of these

4. The value of log 0.0001 to the base 0.1 is
   a) - 4   b) 4
   c) 1/4   d) none of these

5. log (1/81) to the base 9 is equal to
   a) 2   b) ½
   c) -2   d) none of these

6. The value of $\log \dfrac{1}{3}$ to the base 9 is
   a) - ½   b) ½
   c) 1   d) none of these

7. log 0.0625 to the base 2 is equal to
   a) 4   b) 5
   c) 1   d) none of these

8. $\log_{2\sqrt{2}}(512) : \log_{3\sqrt{2}} 324 =$ *(Scanner)*
   a) 128 : 81   b) 2 : 3
   c) 3 : 2   d) None

9. If $\log_a (\sqrt{3})$ = 1/6 find the value of 'a'.
   a) 81   b) 9
   c) 27   d) 3

10. If $\log_a b + \log_a c = 0$ then   *(Scanner)*
    a) b = c
    b) b = - c
    c) b = c = 1
    d) b and c are reciprocals.

11. Find the value of log 5 if log 2 is equal to .3010.
    a) .6980   b) .6990
    c) .9069   d) none of these

12. If log x = a + b, log y = a − b then the value of
    $\log \dfrac{10x}{y^2} = \underline{\quad}$.   *(Scanner)*

    a) 1 − a + 3b   b) a − 1 + 3b
    c) a + 3b + 1   d) 1 − b + 3a

13. Given log2 = 0.3010 and log 3 = 0.4771 the value of log 6 is
    a) 0.9030   b) 0.9542
    c) 0.7781   d) none of these

14. Given that $\log_{10}2$ = x and $\log_{10} 3$ = y, the value of $\log_{10} 60$ is expressed as
    a) x − y + 1   b) x + y + 1
    c) x − y − y   d) none of these

15. Given that $\log_{10}2$ = x, $\log_{10}3$ = y, then $\log_{10}$ 1.2 is expressed in terms of x and y as
    a) x + 2y − 1   b) x + y − 1
    c) 2x + y − 1   d) none of these

16. If log 2 = 0.3010 and log 3 = 0.4771, then the value of log 24 is: *(Scanner)*
    a) 1.0791   b) 1.7323
    c) 1.3801   d) 1.8301

17. Given that log x = m + n and log y = m − n, the value of log $10x/y^2$ is expressed in terms of m and n as: *(Scanner)*
    a) 1 − m + 3n
    b) m − 1 + 3n
    c) m + 3n + 1
    d) none of these

18. The value $\dfrac{\log_3 8}{\log_9 16 . \log_4 10}$ is: *(Scanner)*

    a) 3 $\log_{10}2$ b) 7 $\log_{10}3$
    c) 3 $\log_e$ z   d) none.

19. log 144 is equal to: *(Scanner)*
    a) 2 log 4 + 2 log 2
    b) 4 log 2 + 2 log 3
    c) 3 log 2 + 4 log 3

d) 3 log 2 − 4 log 3

20. The simplified value of 2 $\log_{10}$ 5 + $\log_{10}8$ − ½ $\log_{10}$ 4 is
    a) 1/2   b) 4
    c) 2   d) none of these

21. The value of is 4 log $\dfrac{8}{25}$ − 3 log $\dfrac{16}{125}$ − log 5 is
    a) 0   b) 1
    c) 2   d) -1

22. $7 \log\left(\dfrac{16}{15}\right) + 5 \log\left(\dfrac{25}{24}\right) + 3 \log\left(\dfrac{81}{80}\right)$ is equal to:
                              (Scanner)
    a) 0   b) 1
    c) log 2   d) log 3

23. $a^{\log_a b - \log_a c} \times b^{\log_b c - \log_b a} \times c^{\log_c a - \log_c b}$ has a value of
    a) 1   b) 0
    c) -1   d) None

24. The value of is $a^{\log_a\left(\frac{b}{c}\right)} . b^{\log_b\left(\frac{c}{a}\right)} . c^{\log_c\left(\frac{a}{b}\right)}$
    a) 0   b) 1
    c) -1   d) None

25. The value of $(bc)^{\log_{bc}\frac{b}{c}} . (ca)^{\log_{ca}\frac{c}{a}} . (ab)^{\log_{ab}\frac{a}{b}}$ is
    a) 0   b) 1
    c) -1   d) None

26. $a^{\left(\frac{1}{\log_b a}\right)}$ has a value of
    a) a   b) b
    c) (a + b)   d) None

27. The value of the following expression $a^{\log_a b . \log_b c . \log_c d . \log_d t}$ is given by
    a) t   b) abcdt
    c) (a + b + c + d + t)   d) None

28. $\log_b$ (a).$\log_c$ (b).$\log_a$ (c) is equal to
    a) 0   b) 1
    c) -1   d) None

29. The value of $\log_4$ 9. $\log_3$ 2 is: *(Scanner)*
    a) 3   b) 9

c) 2 d) 1

30. $\log_b\left(a^{\frac{1}{2}}\right).\log_c(b^3).\log_a\left(c^{\frac{2}{3}}\right)$ is equal to

a) 0 b) 1
c) -1 d) None

31. The value of $\log\dfrac{a^n}{b^n}+\log\dfrac{b^n}{c^n}+\log\dfrac{c^n}{a^n}$ is

a) 0 b) 1
c) -1 d) None

32. The value of $\log\dfrac{a^2}{bc}+\log\dfrac{b^2}{ca}+\log\dfrac{c^2}{ab}$ is

a) 0 b) 1
c) -1 d) None

33. $\log(a^9)+\log a=10$ if the value of a is given by

a) 0 b) 10
c) -1 d) None

34. On solving the equation $\log t+\log(t-3)=1$ we get the value of t as

a) 5 b) 2
c) 3 d) 0

35. If $\log_{10000}x=\dfrac{-1}{4}$, then x is given by: **(Scanner)**

a) $\dfrac{1}{100}$ b) $\dfrac{1}{10}$

c) $\dfrac{1}{20}$ d) None of these.

36. The value of $\dfrac{1}{\log_a(ab)}+\dfrac{1}{\log_b(ab)}$ is

a) 0 b) 1
c) -1 d) None

37. Value of $\dfrac{1}{\log_3^{60}}+\dfrac{1}{\log_4^{60}}+\dfrac{1}{\log_5^{60}}$ is: **(Scanner)**

a) 0 b) 1 c) 5 d) 60

38. If $\dfrac{1}{\log_a t}+\dfrac{1}{\log_b t}+\dfrac{1}{\log_c t}=\dfrac{1}{\log_z t}$ then the value of z is given by

a) abc b) a + b + c
c) a(b + c) d) (a + b)c

39. $\dfrac{1}{\log_{ab}(abc)}+\dfrac{1}{\log_{bc}(abc)}+\dfrac{1}{\log_{ca}(abc)}$

(Scanner)

a) 0 b) 1
c) 2 d) -1

40. $\dfrac{1}{\log_{a/b}(x)}+\dfrac{1}{\log_{b/c}(x)}+\dfrac{1}{\log_{c/a}(x)}$ is equal to

a) 0 b) 1
c) 3 d) -1

41. $\dfrac{1}{1+\log_a(bc)}+\dfrac{1}{1+\log_b(ca)}+\dfrac{1}{1+\log_c(ab)}$ is equal to

a) 0 b) 1 c) 3 d) -1

42. If $l=1+\log_a bc$, $m=1+\log_b ca$, , $n=1+\log_c ab$ then the value of $\dfrac{1}{l}+\dfrac{1}{m}+\dfrac{1}{n}-1$ is

a) 0 b) 1
c) -1 d) 3

43. If $x=1+\log_p qr$, $y=1+\log_q rp$ and $z=1+\log_r pq$ then the value of $\dfrac{1}{x}+\dfrac{1}{y}+\dfrac{1}{z}=$ ____

(Scanner)

a) 0 b) 1
c) -1 d) 3

44. If $\dfrac{\log a}{y-z}=\dfrac{\log b}{z-x}=\dfrac{\log c}{x-y}$ the value of abc is

a) 0 b) 1
c) -1 d) None

45. If $\dfrac{\log a}{y-z}=\dfrac{\log b}{z-x}=\dfrac{\log c}{x-y}$ the value of $a^{y+z}.b^{z+x}.c^{x+y}$ is given by

a) 0 b) 1
c) -1 d) None

46. If $\log a=\dfrac{1}{2}\log b=\dfrac{1}{5}\log c$ the value of $a^4 b^3 c^{-2}$ is

a) 0 b) 1
c) -1 d) None

47. If $\frac{1}{2}\log a = \frac{1}{3}\log b = \frac{1}{5}\log c$ the value of $a^4 - bc$ is
    a) 0   b) 1
    c) -1   d) None

48. If $\frac{1}{4}\log_2 a = \frac{1}{6}\log_2 b = -\frac{1}{24}\log_2 c$ the value of $a^3 b^2 c$ is
    a) 0   b) 1
    c) -1   d) None

49. If $\log_2 [\log_3 (\log_2 x)] = 1$, then x equals:
    (Scanner)
    a) 128   b) 256
    c) 512   d) None

50. If $\log_3 [\log_4 (\log_2 x)] = 0$, then the value of 'x' will be: *(Scanner)*
    a) 4   b) 8   c) 16   d) 32

51. The value of $\log_2 \log_2 \log_2 16$ *(Scanner)*
    a) 0   b) 2
    c) 1   d) none of these

52. The value of $\log_2[\log_2 \{\log_3 (\log_3 27^3)\}]$ is equal to
    a) 1   b) 2
    c) 0   d) none of these

53. $\log_4 (x^2 + x) - \log_4(x + 1) = 2$. Find x
    (Scanner)
    a) 16   b) 0
    c) - 1   d) None of these.

54. Solve : $\left(\frac{\log_{10} x - 3}{2}\right) + \left(\frac{11 - \log_{10} x}{3}\right) = 2$
    (Scanner)
    a) 10^{-1} b) 10^2
    c) 10   d) 10^3

55. If $\log_x y = 100$ and $\log_2 x = 10$, then the value of 'y' is: *(Scanner)*
    a) 2^{10} b) 2^{100}
    c) $2^{1,000}$ d) $2^{10,000}$

56. If $\log x + \log y = \log (x + y)$, y can be expressed as
    a) x-1   b) x
    c) x/x-1   d) none of these

57. $\log (m + n) = \log m + \log n$, m can be expressed as: *(Scanner)*
    a) $m = \frac{n}{n-1}$ b) $m = \frac{n}{n+1}$
    c) $m = \frac{n+1}{n}$ d) $m = \frac{n+1}{n-1}$

58. Find the value of $\log (x^6)$ if $\log (x) + 2 \log(x^2) + 3 \log (x^3) = 14$.
    a) 3   b) 4
    c) 5   d) 6

59. If $\log_2 x + \log_4 x + \log_{16} x = 21/4$, these x is equal to
    a) 8   b) 4
    c) 16   d) none of these

60. If $\log_2 x + \log_4 x = 6$, then the Value of x is:
    (Scanner)
    a) 16   b) 32
    c) 64   d) 128

61. If $\log_4 X + \log_{16} X + \log_{64} X + \log_{256} X = 25/6$ then the value of x is
    a) 64   b) 4
    c) 16   d) 2

62. For what value of x, the equation $(\log_{\sqrt{x}} 2)^2 = \log_x 2$ is true?   *(Scanner)*
    a) 16   b) 32
    c) 8   d) 4

63. For any three consecutive integers x y z the equation $\log(1+xz) - 2\log y = 0$ is
    a) True
    b) False
    c) Sometimes true
    d) cannot be determined in the cases of variables with cyclic order.

Set - C

1. log $[1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$ can be written as
    a) log x^2 b) log x
    c) log 1/x   d) none of these

2. The simplified value of log $\sqrt[4]{729 \sqrt[3]{9^{-1} . 27^{-4/3}}}$
    a) log 3   b) log 2
    c) log ½   d) none of these

3. If a = b^2 = c^3 = d^4 then the value of $\log_a$ (abcd) is
    a) $1 + \dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4}$ b) $1 + \dfrac{1}{2!} + \dfrac{1}{3!} + \dfrac{1}{4!}$
    c) 1+2+3+4   d) None

4. The value of
    2 log x + 2 log x^2 + 2 log x^3 +-----+
    2 log x^n will be: *(Scanner)*
    a) $\dfrac{n(n+1)\log x}{2}$
    b) n(n + 1) log x
    c) n^2 log x
    d) None of these.

5. The sum of the series $\log_a b + \log_{a^2} b^2 + \log_{a^3} b^3 + \dots \log_{a^n} b^n$ is given by
    a) $\log_a b^n$ b) $\log_{a^n} b$
    c) $\log_{a^n} b^n$ d) None

6. The value of log ($1^3 + 2^3 + 3^3 + \dots n^3$) is equal to: *(Scanner)*
    a) 3 log 1 + 3 log 2 + ... + 3 log n
    b) 2 log n + 2 log (n+1) – 2 log 2
    c) log n + log (n+1) + log (2n + 1) – log 6
    d) 1

7. If a = $\log_{24} 12$, b = $\log_{36} 24$, and c = $\log_{48} 36$ then 1 + abc = ?
    a) 2bc   b) 4cb
    c) 6ac   d) none

8. On solving the equation $\log_3$ [$\log_2 (\log_3 t)$] = 1 we get the value of t as
    a) 8   b) 18   c) 81   d) 6561

9. On solving the equation $\log_{½}$ [$\log_t (\log_4 32)$] = 2 we get the value of t as
    a) $\dfrac{5}{2}$ b) $\dfrac{25}{4}$
    c) $\dfrac{625}{16}$ d) None

10. If log (2a – 3b) = log a – log b, then a = :
                                          (Scanner)
    a) $\dfrac{3b^2}{2b-1}$ b) $\dfrac{3b}{2b-1}$
    c) $\dfrac{b^2}{2b+1}$ d) $\dfrac{3b^2}{2b+1}$

11. The value of
    $\log_5\left(1+\dfrac{1}{5}\right) + \log_5\left(1+\dfrac{1}{6}\right) +$ --------------------
    --+ $\log_5\left(1+\dfrac{1}{624}\right)$ *(Scanner)*
    a) 2   b) 3
    c) 5   d) 0

12. The value of $\log_8 25$ given log 2 = 0.3010 is
    a) 1   b) 2
    c) 1.5482   d) none of these

13. If $x^{2a-3} y^{2a} = x^{6-a} y^{5a}$ then the value of a log $\left(\dfrac{x}{y}\right)$ is
    a) 3 log x   b) log x
    c) 6 log x   d) 5 log x

14. If log $\dfrac{a+b}{3} = \dfrac{1}{2}$ (loga+logb) then the value of $\dfrac{a}{b} + \dfrac{b}{a}$ is
    a) 2   b) 5
    c) 7   d) 3

15. If $a^2 + b^2 = 7ab$ then the value of is log $\dfrac{a+b}{3} - \dfrac{\log a}{2} - \dfrac{\log b}{2}$
    a) 0   b) 1
    c) -1   d) 7

16. If $a^3 + b^3 = 0$ then the value of log $(a+b) - \dfrac{1}{2}$

    $(\log a + \log b + \log 3)$ is equal to
    a) 0   b) 1
    c) -1   d) 3

17. If $x = \dfrac{e^n - e^{-n}}{e^n + e^{-n}}$ then the value of n is

    a) $\dfrac{1}{2}\log_e \dfrac{1+x}{1-x}$

    b) $\log_e \dfrac{1+x}{1-x}$

    c) $\log_e \dfrac{1-x}{1+x}$

    d) $\dfrac{1}{2}\log_e \dfrac{1-x}{1+x}$

Set – D

1. If $x = \log_a bc$; $y = \log_b ca$; $z = \log_c ab$ then the value of $xyz - x - y - z$ is
    a) 0   b) 1
    c) -1   d) 2

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Equations

Synopsis :

Nature and Degree of an Equation :

1) An equation with one unknown is called a simple equation.

2) Equations with more than one unknown are called simultaneous equations.

3) The degree of an equation is the degree of the highest power of the unknown present in the equation.

4) An equation of degree one in the variable is called as linear equation.

5) An equation of degree two in the variable is called a quadratic equation.

6) An equation of degree three in the variable is called a cubic equation and so on.

1) Root of Equation :
Any value (or values) of the variable (or variables) which satisfy given equation is called as Root of Equation.

2) Linear Equation
An equation of the form ax + by + c = 0, where a, b, c are constants is called as Linear Equation.
1) ax + b = 0 is Linear Equation in one variable
2) ax + by + c = 0 is Linear Equation in two variables.

Nature of Simultaneous Equations : If $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are two simultaneous linear equations then we have –

Nature of Solution	Condition	Nature of equation	Nature of lines
Unique Solution	$\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$	Consistent	Intersecting
No solution	$\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$	Inconsistent	Parallel
Infinitely many solution	$\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$	Consistent	Coincident i.e. one above another

Part - I
Linear Equations
(Module + Scanner)
Set - A

1. Pick up the correct value of x for $\frac{x}{30} = \frac{2}{45}$
   a) x = 5   b) x = 7
   c) x = $1\frac{1}{3}$ d) none of these

2. The equation $-7x + 1 = 5 - 3x$ will be satisfied for x equal to:
   a) 2   b) -1
   c) 1   d) none of these

3. The solution of the equation $\frac{x+24}{5} = 4 + \frac{x}{4}$
   a) 6   b) 10
   c) 16   d) none of these

4. If $kx - 4 = (k - 1)x$, then which of the following is true? *(Scanner)*
   a) x = - 5   b) x = - 4
   c) x = - 3   d) x = + 4

5. The root of the equation $\frac{x+4}{4} + \frac{x-5}{3} = 11$ is
   a) 20   b) 10
   c) 2   d) none of these

6. $\frac{2x+5}{10} + \frac{3x+10}{15} = 5$ *(Scanner)*
   a) 10.58   b) 9.58
   c) 9.5   d) None

7. The solution of the equation $(p+2)(p-3) + (p+3)(p-4) = p(2p-5)$ is
   a) 6   b) 7
   c) 5   d) none of these

8. If $|x - 2| + |x - 3| = 7$ then, 'x' will be equal to
   a) 6   b) - 1   *(Scanner)*
   c) 6 and -1   d) None of the above.

9. The solution of the set of equations $3x + 4y = 7, 4x - y = 3$ is
   a) (1, -1)   b) (1, 1)
   c) (2, 1)   d) (1, -2)

10. Solve for x and y : x-3y = 0, x+2y = 20.
    a) x = 4, y = 12
    b) x = 12, y = 4
    c) x = 5, y = 4
    d) none of these

11. The simultaneous equations $7x - 3y = 31, 9x - 5y = 41$ have solutions given by
    a) (-4, -1)   b) (-1, 4)
    c) (4, -1)   d) (3, 7)

12. $1.5x + 2.4y = 1.8, 2.5(x+1) = 7y$ have solutions as
    a) (0.5, 0.4)   b) (0.4, 0.5)
    c) $(\frac{1}{2}, \frac{2}{5})$ d) (2, 5)

13. $1.5x + 3.6y = 2.1, 2.5(x+1) = 6y$
    a) (0.2, 0.5)   b) (0.5, 0.2)
    c) (2, 5)   d) (-2, -5)

14. Solving $6x+5y-16=0$ and $3x-y-1=0$ we get values of x and y as
    a) 1, 1   b) 1, 2
    c) -1, 2   d) 0, 2

15. If the ratio of $(5x - 3y)$ and $(5y - 3x)$ is 3 : 4, then the value of x : y is: *(Scanner)*
    a) 27 : 29
    b) 29 : 27
    c) 3 : 4
    d) 4 : 3

16. The values of x and y satisfying the equations $\frac{x}{2} + \frac{y}{3} = 2$, x + 2y = 8 are given by the pair.
    a) (3, 2)
    b) (-2, -3)
    c) (2, 3)
    d) none of these

17. $\frac{x}{5} + \frac{y}{6} + 1 = \frac{x}{6} + \frac{y}{5} = 28$
    a) (6, 9)   b) (9, 6)
    c) (60, 90)   d) (90, 60)

18. If $\dfrac{3}{x+y} + \dfrac{2}{x-y} = -1$ and $\dfrac{1}{x+y} - \dfrac{1}{x-y} = \dfrac{4}{3}$

    then (x, y) is: *(Scanner)*
    a) (2, 1)   b) (1, 2)
    c) (-1, 2)   d) (-2, 1)

19. $\dfrac{x}{p} + \dfrac{y}{q} = 2$, x + y = p + q are satisfied by the

    values given by the pair.
    a) (x = p, y = q)
    b) (x=q, y=p)
    c) (x=1, y=1)
    d) none of these

20. 3x-4y + 70z = 0, 2x + 3y − 10z = 0, x + 2y+3z = 13
    a) (1, 3, 7)   b) (1, 7, 3)
    c) (2, 4, 3)   d) (-10, 10, 1)

21. 2x + 3y + 4z = 0, x + 2y = 5z = 0, 10x + 16y − 6z = 0
    a) (0, 0, 0)
    b) (1, -1, 1)
    c) (3, 2, -1)
    d) (1, 0, 2)

22. $\dfrac{x}{4} = \dfrac{y}{3} = \dfrac{z}{2}$; 7x + 8y + 5z = 62
    a) (4, 3, 2)   b) (2, 3, 4)
    c) (3, 4, 2)   d) (4, 2, 3)

23. The sum of two numbers is 52 and their difference is 2. The numbers are
    a) 17 and 15
    b) 12 and 10
    c) 27 and 25
    d) none of these

24. The product of two numbers is 3200 and the quotient when the larger number is divided by the smaller is 2. The numbers are
    a) (16, 200)
    b) (160, 20)
    c) (60, 30)
    d) (80, 40)

25. Monthly incomes of two persons are in the ratio 4 : 5 and their monthly expenses are in the ratio 7 : 9. If each saves Rs.50 per month find their monthly incomes
    a) (500, 400)   b) (400, 500)
    c) (300, 600)   d) (350, 550)

26. The denominator of a fraction exceeds the numerator by 5 and if 3 be added to both the fraction becomes $\dfrac{3}{4}$. Find the fraction.

    a) $\dfrac{10}{15}$ b) $\dfrac{12}{17}$

    c) $\dfrac{17}{15}$ d) none of these

27. A number consists of two digits the digit in the ten's place is twice the digit in the unit's place. If 18 be subtracted from the number the digits are reversed. Find the number.

    a) 44   b) 50
    c) 42   d) none of these

28. The sum of the digits of a two digit number is 10. If 18 be subtracted from it the digits in the resulting number will be equal. The number is
    a) 37
    b) 73
    c) 75
    d) none of these numbers.

29. A number consists of two digits. The digits in the ten's place is 3 times the digit in the unit's place. If 54 is subtracted from the number the digits are reversed. The number is
    a) 39   b) 92
    c) 93   d) 94

30. A number between 10 and 100 is five times the sum of its digits. If 9 be added to it the digits are reversed find the number.
    a) 54   b) 53
    c) 45   d) 55

31. A number consisting of two digits is four times the sum of its digits and if 27 be added to it the digits are reversed. The number is:
    a) 63   b) 35
    c) 36   d) 60

32. Of two numbers, 1/5th of the greater is equal to 1/3rd of the smaller and their sum is 16. The numbers are:
    a) (6, 10)
    b) (9, 7)
    c) (12, 4)   d) (11, 5)

33. The fourth part of a number exceeds the sixth part by 4. The number is
    a) 84   b) 44
    c) 48   d) none of these

34. If a number of which the half is greater than $\dfrac{1}{5}$

    th of the number by 15 then the number is
    a) 50   b) 40
    c) 80   d) none of these.

35. Ten years ago the age of a father was four times of his son. Ten years hence the age of the father will be twice that of his son. The present ages of the father and the son are.
    a) (50, 20)
    b) (60, 20)
    c) (55, 25)
    d) none of these

36. y is older than x by 7 years 15 years back x's age was 3/4 of y's age. Their present ages are:
    a) (x=36, y=43)
    b) (x=50, y=43)
    c) (x=43, y=50)
    d) (x=40, y=47)

Set - B

1. 8 is the solution of the equation
    a) $\dfrac{x+4}{4}+\dfrac{x-5}{3}=11$

    b) $\dfrac{x+4}{2}+\dfrac{x+10}{9}=8$

    c) $\dfrac{x+24}{5}=4+\dfrac{x}{4}$

    d) $\dfrac{x-15}{10}+\dfrac{x+5}{5}=4$

2. The equation $\dfrac{12x+1}{4}=\dfrac{15x-1}{5}+\dfrac{2x-5}{3x-1}$ is true for
    a) x = 1   b) x = 2

    c) x = 5   d) x = 7

3. Pick up the correct value x for which $\dfrac{x}{0.5}-\dfrac{1}{0.05}+\dfrac{x}{0.005}-\dfrac{1}{0.0005}=0$
    a) x = 0
    b) x = 1
    c) x = 10
    d) none of these

4. The value of y that satisfies the equation $\dfrac{y+11}{6}-\dfrac{y+1}{9}=\dfrac{y+7}{4}$ is
    a) -1   b) 7
    c) 1   d) $-\dfrac{1}{7}$

5. The pair satisfying the equations x + 5y = 36, $\dfrac{x+y}{x-y}=\dfrac{5}{3}$ is given by
    a) (16, 4)   b) (4, 16)
    c) (4, 8)   d) none of these.

6. Solve for x and y: $\dfrac{4}{5}-\dfrac{5}{y}=\dfrac{x+y}{xy}+\dfrac{3}{10}$ and 3xy = 10 (y-x).
    a) (5, 2)   b) (-2, -5)
    c) (2, -5)   d) (2, 5)

7. The values of x and y satisfying the equations $\dfrac{3}{x+y}+\dfrac{2}{x-y}=3,\ \dfrac{2}{x+y}+\dfrac{3}{x-y}=3\dfrac{2}{3}$ are given by
    a) (1, 2)   b) (-1, -2)
    c) $(1,\dfrac{1}{2})$ d) (2, 1)

8. Solving $9^x = 3^y$ and $5^{x+y+1} = 25^{xy}$ we get the following roots
    a) 1, 2   b) 0, 1   c) 0, 3   d) 1, 3

9. If $2^{x+y} = 2^{2x-y} = \sqrt{8}$, then the respective values of x and y are ___
    (Scanner)
    a) $1,\dfrac{1}{2}$ b) $\dfrac{1}{2},1$
    c) $\dfrac{1}{2},\dfrac{1}{2}$ d) None of these

10. Solving $9x + 3y - 4z = 3$, $x + y - z = 0$ and $2x-5y-4z=-20$ following roots are obtained
    a) 2, 3, 4   b) 1, 3, 4
    c) 1, 2, 3   d) None

11. The solution for the pair of equation
    $\frac{1}{16x} + \frac{1}{15y} = \frac{9}{20}, \frac{1}{20x} - \frac{1}{27y} = \frac{4}{45}$ is given by
    a) $\left(\frac{1}{4}, \frac{1}{3}\right)$ b) $\left(\frac{1}{3}, \frac{1}{4}\right)$
    c) (3 4)   d) (4 3)

12. $\frac{4}{x} - \frac{5}{y} = \frac{x+y}{xy} + \frac{3}{10}$ 3 $xy = 10$ (y-x)
    a) (2, 5)   b) (5, 2)
    c) (2, 7)   d) (3, 4)

13. $\frac{1}{3}(x+y) + 2z = 21$, $3x - \frac{1}{2}(y+z) = 65$, $x + \frac{1}{2}(x+y-z) = 38$
    a) (4, 9, 5)   b) (2, 9, 5)
    c) (24, 9, 5)   d) (5, 24, 9)

14. $\frac{x}{0.01} + \frac{y+0.03}{0.05} = \frac{y}{0.02} + \frac{x+0.03}{0.04} = 2$
    a) (1, 2)   b) (0.1, 0.2)
    c) (0.01, 0.02)   d) (0.02, 0.01)

15. $\frac{xy}{y-x} = 110, \frac{yz}{z-y} = 132, \frac{zx}{z+x} = \frac{60}{11}$
    a) (12, 11, 10)   b) (10, 11, 12)
    c) (11, 10, 12)   d) (12, 10, 11)

16. Solve for x, y and z:
    $\frac{xy}{x+y} = 70, \frac{xz}{x+z} = 84, \frac{yz}{y+z} = 140$
    a) 400, 100, 200   b) 105, 210, 420
    c) 100, 120, 210   d) 110, 220, 330

17. Solve for x, y and z:
    $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 5$, $\frac{2}{x} - \frac{3}{y} - \frac{4}{z} = -11$, $\frac{3}{x} + \frac{2}{y} - \frac{1}{z} = -6$
    a) $\frac{1}{2}, \frac{1}{3}, \frac{1}{6}$ b) $\frac{-1}{2}, \frac{1}{3}, \frac{1}{6}$
    c) $\frac{1}{2}, \frac{-1}{3}, \frac{1}{6}$ d) $\frac{1}{2}, \frac{1}{3}, \frac{-1}{6}$

18. Let E_1 and E_2 are two linear equations in two variables x and y. (0, 1) is a solution of both equations E_1 and E_2. (2, -1) is a solution of equation E_1 only and (-2, -1) is solution of E_2 only then E_1 and E_2 are _____.
    (Scanner)
    a) $x = 0, y = 1$
    b) $2x - y = -1, 4x + y = 1$
    c) $x + y = 1, x - y = -1$
    d) $x + 2y = 2, x + y = 1$

19. The diagonal of a rectangle is 5 cm and one of at sides is 4 cm. Its area is
    a) 20 sq.cm.   b) 12 sq.cm.
    c) 10 sq.cm.   d) none of these

20. Divide 56 into two parts such that three times the first part exceeds one third of the second by 48. The parts are.
    a) (20, 36)   b) (25, 31)
    c) (24, 32)   d) none of these

21. A man sells 6 radios and 4 televisions for Rs.18,480. If 14 radios and 2 televisions are sold for the same amount, what is the price of a television?   *(Scanner)*
    a) Rs.1,848   b) Rs.840
    c) Rs.1,680   d) Rs.3,360

22. Three persons Mr. Roy, Mr. Paul and Mr. Singh together have Rs.51. Mr. Paul has Rs.4 less than Mr. Roy and Mr. Singh has got Rs.5 less than Mr.Roy. They have the money as.
    a) (Rs.20, Rs.16, Rs.15)
    b) (Rs.15, Rs.20, Rs.16)
    c) (Rs.25, Rs.11, Rs.15)
    d) None of these

23. A man went to the Reserve Bank of India with Rs.1,000. He asked the cashier to give him Rs.5 and Rs.10 notes only in return. The man got 175 notes in all. Find how many notes of Rs.5 and Rs.10 did he receive?   *(Scanner)*
    a) (25, 150)   b) (40, 110)
    c) (150, 25)   d) None

24. the wages of 8 men and 6 boys amount to Rs.33. If 4 men earn Rs.4.50 more than 5 boys determine the wages of each man and boy.
    a) (Rs.1.50, Rs.3)

b) (Rs.3, Rs.1.50)

c) (Rs.2.50, Rs.2)

d) (Rs.2, Rs.2.50)

25. A man starts his job with a certain monthly salary and earns a fixed increment every year. If his salary was Rs.1,500 after 4 years of service and Rs.1,800 after 10 years of service, what was his starting salary and what is the annual increment in rupees?
    (Scanner)
    a) Rs.1,300, Rs.50
    b) Rs.1,100, Rs.50
    c) Rs.1,500, Rs.30
    d) None

26. The demand and supply equations for a certain commodity are 4q + 7p = 17 and $p = \dfrac{q}{3} + \dfrac{7}{4}$. respectively where p is the market price and q is the quantity then the equilibrium price and quantity are:
    a) $2, \dfrac{3}{4}$
    b) $3, \dfrac{1}{2}$
    c) $5, \dfrac{3}{5}$
    d) None of these

27. For a certain commodity the demand equation giving demand 'd' in kg, for a price 'p' in rupees per kg. is d = 100 (10 – p). The supply equation giving the supply s in kg. for a price p in rupees per kg. is s = 75 (p - 3). The market price is such at which demand equals supply. Find the quantity that will be bought and sold.
    a) 500 kg
    b) 700 kg
    c) 300 kg
    d) none of these

28. Find the fraction which is equal to 1/2 when both its numerator and denominator are increased by 2. It is equal to 3/4 when both are increased by 12.
    a) 3/8
    b) 5/8
    c) 2/8
    d) 2/3

29. If the numerator of a fraction is increased by 2 and the denominator by 1 it becomes 1. Again if the numerator is decreased by 4 and the denominator by 2 it becomes 1/2. Find the fraction.
    a) 1/4
    b) 2/5

c) 3/4
d) 7/8.

30. The denominator of a fraction exceeds the numerator by 2. If 5 be added to the numerator the fraction increases by unity. The fraction is.
    a) $\dfrac{5}{7}$
    b) $\dfrac{1}{3}$
    c) $\dfrac{7}{9}$
    d) $\dfrac{3}{5}$

31. Two numbers are such that twice the greater number exceeds twice the smaller one by 18 and 1/3rd of the smaller and 1/5th of the greater number are together 21. The numbers are:
    a) (36, 42)
    b) (45, 36)
    c) (50, 41)
    d) (55, 46)

32. The sum of the digits of a three digit number is 12. If the digits are reversed the number is increased by 495 but reversing only of the ten's and unit digits increase the number by 36.the number is
    a) 327
    b) 372
    c) 237
    d) 273

33. A number consist of three digit of which the middle one is zero and the sum of the other digits is 9. The number formed by interchanging the first and third digits is more than the original number by 297 find the number.
    a) 303
    b) 206
    c) 306
    d) none of these

34. One student is asked to divide a half of a number by 6 and other half by 4 and then to add the two quantities. Instead of doing so the student divides the given number by 5. If the answer is 4 short of the correct answer then the number was
    a) 320
    b) 400
    c) 480
    d) none of these

35. If thrice of A's age 6 years ago be subtracted from twice his present age, the result would be equal to his present age. Find A's present age.

a) 5 years
b) 7 years
c) 13 years
d) 9 years

<u>Set - C</u>

1. The age of a man is three times the sum of the ages of his two sons and 5 years hence his age will be double the sum of their ages. Find the present age of the man?
    a) 45 years
    b) 55 years
    c) 43 years
    d) 38 years

2. The age of a person is twice the sum of the ages of his two sons and five years ago his age was thrice the sum of their ages. Find his present age.
    a) 60 years
    b) 52 years
    c) 51 years
    d) 50 years

Quadratic Equation :

Synopsis :

Any equation of the form $ax^2 + bx + c = 0$ where a, b, c are constants and a is not equal to zero is called as Quadratic equation.

Methods of Finding Roots of Quadratic Equation :

1) Factorizations (Direct Observation)
2) By using Formula

$$\alpha, \beta = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Roots of Quadratic equation

The values of x satisfying the equation $ax^2 + bx + c = 0$ are called roots of the equation. These are given by:

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{And} \quad \beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Part - II
Quadratic Equations
Set - A

1. Find the value of K in $3x^2 - 2kx + 5 = 0$ if $x = 2$
    (Scanner)
    a) 17/4   b) - 7/14
    c) 4/17   d) - 4/17

2. Solving equation $x^2 - 24x + 135 = 0$ are, value(s) of x
    a) 9, 6   b) 9, 15
    c) 15, 6   d) None

3. Solving equation $3x^2 - 14x + 16 = 0$ we get roots as
    a) ± 1 b) 2 and $\dfrac{8}{3}$
    c) 0   d) None

4. Solving $x^2 + y^2 - 25 = 0$ and $x-y-1=0$ we get the roots as under
    a) $\pm 3 \pm 4$ b) $\pm 2 \pm 3$
    c) 0, 3, 4   d) -3, -4

5. Solving $\sqrt{\dfrac{x}{y}} + \sqrt{\dfrac{y}{x}} - \dfrac{5}{2} = 0$ and $x+y-5=0$ we get the roots as under
    a) 1, 4   b) 1, 2
    c) 1, 3   d) 1, 5

6. The values of x for the equation $x^2 + 9x + 18 = 6 - 4x$ are
    a) (1, 12)   b) (-1, -12)
    c) (1, -12)   d) (-1, 12)

7. Solving equation $x^2 - (a+b) x + ab = 0$ are, value(s) of x
    a) a, b   b) a
    c) b   d) None

8. If $\dfrac{x}{b} + \dfrac{b}{x} = \dfrac{a}{b} + \dfrac{b}{a}$ the roots of the equation are
    a) $a, b^2/a$ b) $a^2, b/a^2$
    c) $a^2, b^2/a$ d) a, b^2

9. A solution of the quadratic equation $(a+b-2c)x^2 + (2a-b-c)x + (c+a-2b) = 0$ is
    a) $x = 1$ b) $x = -1$
    c) $x = 2$ d) $x = -2$

10. The values of x in the equation $7(x+2p)^2 + 5p^2 = 35xp + 117p^2$ are
    a) (4p, -3p)   b) (4p, 3p)
    c) (-4p, 3p)   d) (-4p, -3p)

11. Solving equation $\dfrac{6x+2}{4} + \dfrac{2x^2-1}{2x^2+2} = \dfrac{10x-1}{4x}$ we get roots as
    a) ± 1 b) 1
    c) -1   d) 0

12. If $x = m$ is one of the solutions of the equation $2x^2 + 5x - m = 0$ the possible values of m are
    a) (0, 2)   b) (0, -2)
    c) (0, 1)   d) (1, -1)

13. The sum of two numbers is 45 and the mean proportional between them is 18. The numbers are
    a) (15, 30)   b) (32, 13)
    c) (36, 9)   d) (25, 20)

14. Divide 50 into two parts such that the sum of their reciprocals is 1/12. The numbers are
    a) (24, 26)   b) (28, 22)
    c) (27, 23)   d) (20, 30)

15. There are two consecutive numbers such that the difference of their reciprocals is 1/240.
    a) (15, 16)   b) (17, 18)
    c) (13, 14)   d) (12, 13)

16. Divide 25 into two parts so that sum of their reciprocals is 1/6.
    a) 10 and 20
    b) 13 and 12
    c) 10 and 15
    d) none of these

17. If the length of a rectangle is 5 cm more than the breadth and if the perimeter of the rectangle is 40 cm, then the length & breadth of the rectangle will be: *(Scanner)*
    a) 7.5 cm, 2.5 cm
    b) 10 cm, 5 cm
    c) 12.5 cm, 7.5 cm

d) 15.5 cm, 10.5 cm

18. If the sum of two numbers is 13 and the sum of their squares is 85, then the numbers will be:
    (Scanner)

    a) 3, 10   b) 5, 8
    c) 4, 9   d) 6, 7

19. The sum of two numbers is 8 and the sum of their squares is 34. Taking one number as x form an equation in x and hence find the numbers.
    a) (7, 10)
    b) (4, 4)
    c) (3, 5)
    d) (2, 6)

20. A number consists of two digits such that the digit in one's place in thrice the digit in ten's place. If 36 be added then the digits are reversed. Find the number____.   *(Scanner)*
    a) 62   b) 26
    c) 39   d) None of these

21. The difference of two positive integers is 3 and the sum of their squares is 89. Taking the smaller integer as x form a quadratic equation and solve it to find the integers. The integers are.
    a) (7, 4)   b) (5, 8)
    c) (3, 6)   d) (2, 5)

22. Two squares have sides p cm and (p + 5) cms. The sum of their squares is 625 sq. cm. The sides of the squares are
    a) (10 cm, 30 cm)
    b) (12 cm, 25 cm)
    c) (15 cm, 20 cm)
    d) none of these

23. The area of a rectangular field is 2000 sq.m and its perimeter is 180m. Form a quadratic equation by taking the length of the field as x and solve it to find the length and breadth of the field. The length and breadth are
    a) (205m, 80m)   b) (50m, 40m)
    c) (60m, 50m)   d) none

Set - B

1. Solve x : $4^x - 3.2^{x+2} + 2^5 = 0$
   a) 1   b) 2   c) 3   d) 4

2. Solve $2^{x-2} + 2^{3-x} = 3$
   a) 1, 3   b) 2, 3
   c) 1, 2   d) None

3. If $2^{2x+3} - 3^2.2^x + 1 = 0$ then values of x are
   a) 0, 1   b) 1, 2
   c) 0, 3   d) 0, -3

4. The solution of the equation $3x^2-17x + 24 = 0$ are
   a) (2, 3)   b) $(2, 3\frac{2}{3})$
   c) $(3, 2\frac{2}{3})$ d) $(3, \frac{2}{3})$

5. Solving equation $3x^2 - 14x + 8 = 0$ we get roots as
   a) ±4   b) ±2
   c) $4, \frac{2}{3}$ d) None

6. If $2x^2 - (a+6) 2X + 12a = 0$ then roots are
   a) 4 & a^2 b) 6 & a
   c) 3 & 2a   d) 6 & 3a

7. Solving $\frac{1}{x^2} + \frac{1}{y^2} - 13 = 0$ and $\frac{1}{x} + \frac{1}{y} - 5 = 0$ we get the roots as under
   a) $\frac{1}{8}, \frac{1}{5}$ b) $\frac{1}{2}, \frac{1}{3}$
   c) $\frac{1}{13}, \frac{1}{5}$ d) $\frac{1}{4}, \frac{1}{5}$

8. Solving $x^2 + xy-21 = 0$ and $xy - 2y^2 + 20 = 0$ we get the roots as under
   a) ±1, ±2   b) ±2, ±3
   c) ±3, ±4   d) None

9. Solving $x^2 + xy+y^2 = 37$ and $3xy+2y^2 = 68$ we get the following roots
   a) ±3, ±4   b) ±4, ±5
   c) ±2, ±3   d) None

10. Solving $4^x \cdot 2^y = 128$ and $3^{3x+2y} = 9^{xy}$ we get the following roots

    a) $\dfrac{7}{4}, \dfrac{7}{2}$ b) 2, 3

    c) Both A & B   d) None of these

11. Solving $x+2y+2z=0$, $3x-4y+z=0$ and $x^2+3y^2+z^2=11$ following roots are obtained

    a) 2, 1, -2 and -2, -1, 2
    b) 2, 1, 2 and -2, -1, -2
    c) only 2, 1, -2
    d) only -2, -1, 2

12. The solutions of the equation $\dfrac{6x}{x+1} + \dfrac{6(x+1)}{x} = 13$ are

    a) (2, 3)
    b) (3, -2)
    c) (-2, -3)
    d) (2, -3)

13. The satisfying values of x for the equation $\dfrac{1}{x+p+q} = \dfrac{1}{x} + \dfrac{1}{p} + \dfrac{1}{q}$ are

    a) (p, q)   b) (-p, -q)
    c) (p, -p)   d) (-p, q)

14. The values of x satisfying the equation $\sqrt{(2x^2 + 5x - 2)} - \sqrt{(2x^2 + 5x - 9)} = 1$ are

    a) (2, -9/2)   b) (4, -9)
    c) (2, 9/2)   d) (-2, 9/2)

15. The equation $\dfrac{3(3x^2 + 15)}{6} + 2x^2 + 9 = \dfrac{2x^2 + 96}{7} + 6$ has got the solution as

    a) (1, 1)
    b) (1/2, -1)
    c) (1, -1)
    d) (2, -1)

16. Solving equation $7\sqrt{\dfrac{x}{1-x}} + 8\sqrt{\dfrac{1-x}{x}} = 15$ following roots are obtained

    a) $\dfrac{64}{113}, \dfrac{1}{2}$ b) $\dfrac{1}{50}, \dfrac{1}{65}$

    c) $\dfrac{49}{50}, \dfrac{1}{65}$ d) $\dfrac{1}{50}, \dfrac{64}{65}$

17. Solving equation $6\left[\sqrt{\dfrac{x}{1-x}} + \sqrt{\dfrac{1-x}{x}}\right] = 13$ following roots are obtained

    a) $\dfrac{4}{13}, \dfrac{9}{13}$

    b) $\dfrac{-4}{13}, \dfrac{-9}{13}$

    c) $\dfrac{4}{13}, \dfrac{5}{13}$

    d) $\dfrac{6}{13}, \dfrac{7}{13}$

18. On solving $\sqrt{\dfrac{x}{1-x}} + \sqrt{\dfrac{1-x}{x}} = 2\dfrac{1}{6}$, we get one value of x as: *(Scanner)*

    a) $\dfrac{4}{13}$ b) $\dfrac{1}{13}$

    c) $\dfrac{2}{13}$ d) $\dfrac{3}{13}$

19. Solving equation $z + \sqrt{z} = \dfrac{6}{25}$ the value of z works out to

    a) $\dfrac{1}{5}$ b) $\dfrac{2}{5}$

    c) $\dfrac{1}{25}$ d) $\dfrac{2}{25}$

20. Solving equation $z^{10} - 33z^5 + 32 = 0$ the following values of z are obtained

    a) 1, 2   b) 2, 3
    c) 2, 4   d) 1, 2, 3

21. When $\sqrt{2z+1} + \sqrt{3z+4} = 7$ the value of z is given by

    a) 1   b) 2
    c) 3   d) 4

22. The value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \ldots \infty}}}$ is: *(Scanner)*

    a) - 3   b) 2
    c) 3   d) 4

23. Solving equation $\left(x - \dfrac{1}{x}\right)^2 - 6\left(x + \dfrac{1}{x}\right) + 12 = 0$ we get roots as follows

    a) 0   b) 1
    c) -1   d) None

24. If $\dfrac{x+2}{x-2} - \dfrac{x-2}{x+2} = \dfrac{x-1}{x+3} - \dfrac{x+3}{x-3}$ then the values of x are

    a) $0, \pm\sqrt{6}$ b) $0, \pm\sqrt{3}$

    c) $0, \pm 2\sqrt{3}$ d) None

25. If $\dfrac{x-a}{b} + \dfrac{x-b}{a} = \dfrac{b}{x-a} + \dfrac{a}{x-b}$ then the values of x are

    a) 0, (a+b), (a-b)   b) 0, (a+b), $\dfrac{a^2+b^2}{a+b}$

    c) 0, (a-b), $\dfrac{a^2+b^2}{a+b}$ d) $\dfrac{a^2+b^2}{a+b}$

26. If $\dfrac{x-a^2-b^2}{c^2} + \dfrac{c^2}{x-a^2-b^2} = 2$ the value of is

    a) $a^2 + b^2 + c^2$

    b) $-a^2-b^2-c^2$

    c) $\dfrac{1}{a^2+b^2+c^2}$

    d) $-\dfrac{1}{a^2+b^2+c^2}$

27. If $\dfrac{x-bc}{b+c} + \dfrac{x-ca}{c+a} + \dfrac{x-ab}{a+b} = a+b+c$ the value of x is

    a) $a^2 + b^2 + c^2$ b) a(a+b+c)

    c) (a+b) (b+c)   d) ab + bc + ca

28. The values of $4 + \cfrac{1}{4 + \cfrac{1}{4 + \cfrac{1}{4 + \dots\infty}}}$

    a) $1 \pm \sqrt{2}$ b) $2 + \sqrt{5}$

    c) $2 \pm \sqrt{5}$ d) none of these

29. Five times of a positive whole number is 3 less than twice the square of the number. The number is

    a) 3   b) 4

    c) -3   d) 2

30. If the square of a number exceeds twice if the number by 15, then the number satisfying the condition is

    a) -5   b) 3

    c) 5   d) 15

31. A distributor of apple Juice has 5000 bottle in the store that it wishes to distribute in a month. From experience it is known that demand D (in number of bottles) is given by $D = -2000p^2 + 2000p + 17000$. The price per bottle that will result zero inventory is

    a) Rs.3   b) Rs.5

    c) Rs.2   d) none of these.

32. The hypotenuse of a right-angled triangle is 20cm. The difference between its other two sides be 4cm. The sides are

    a) (11cm, 15cm)

    b) (12cm, 16cm)

    c) (20cm, 24cm)

    d) none of these

33. If the sides of an equilateral triangle are shortened by 3 units, 4 units and 5 units respectively and a right triangle is formed, then the side of an equilateral triangle is: *(Scanner)*

    a) 6 units   b) 7 units

    c) 8 units   d) 10 units.

34. The sides of an equilateral triangle are shortened by 12 units 13 units and 14 units respectively and a right angle triangle is formed. The side of the equilateral triangle is

    a) 17 units   b) 16 units

    c) 15 units   d) 18 units

35. If area and perimeter of a rectangle is 6000 cm^2 and 340 cm respectively, then the length of rectangle is: *(Scanner)*

    a) 140   b) 120

    c) 170   d) 200

36. A person on a tour has Rs.9,600 for his expenses. If his tour is extended by 16 days, he has to cut down his daily expenses by Rs.20, his original duration of tour had been. *(Scanner)*

    a) 48 days   b) 64 days

    c) 80 days   d) 96 days

37. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of each article (in Rs.) was 2 more than thrice the number of articles produced on that day. If the total cost

of production on that day was Rs.800, the number of articles produced was *(Scanner)*
a) 14   b) 16
c) 12   d) 18

38. The number of students in each section of a school is 36. After admitting 12 new students, four new sections were started. If total number of students in each section now is 30, than the number of sections initially were. *(Scanner)*
a) 6   b) 10
c) 14   d) 18

39. The sum of two irrational numbers multiplied by the larger one is 70 and their difference is multiplied by the smaller one is 12; the two numbers are
a) $3\sqrt{2}, 2\sqrt{3}$ b) $5\sqrt{2}, 3\sqrt{5}$
c) $2\sqrt{2}, 5\sqrt{2}$ d) none of these

40. A piece of iron rod costs Rs.60 If the rod was 2 metre shorter and each metre costs Rs.1.00 more, the cost would remain unchanged. What is the length of the rod?
a) 24m.   b) 12m.
c) 16m.   d) none of these

41. The cost of 2 oranges and 3 apples is Rs. 28. If the cost of an apple is doubled then the cost of 3 oranges and 5 apples is Rs. 75. The original cost of 7 oranges and 4 apples (in Rs) is
a) 59   b) 47
c) 71   d) 63

Set - C

1. Solve $\left(x - \dfrac{1}{x}\right)^2 + 2\left(x + \dfrac{1}{x}\right) = 7\dfrac{1}{4}$.

a) $2\dfrac{1}{2}$

b) $\dfrac{1}{2}$

c) $-2\dfrac{1}{2}$

d) none of these

2. Solving equation $\left(x - \dfrac{1}{x}\right)^2 - 10\left(x - \dfrac{1}{x}\right) + 24 = 0$
we get roots as follows
a) 0   b) 1
c) -1   d) $(2 \pm \sqrt{5}), (3 \pm \sqrt{10})$

3. Solving equation
$\left(x - \dfrac{1}{x}\right)^2 - 5\left(x + \dfrac{1}{x} + 2\right) + 18 = 0$ we get roots as under
a) 0
b) 1
c) -1
d) $-2 \pm \sqrt{3}$

4. Solving equation $6x^4 + 11x^3 - 9x^2 - 11x + 6 = 0$ following roots are obtained
a) $\dfrac{1}{2}, -2, \dfrac{-1 \pm \sqrt{37}}{6}$

b) $-\dfrac{1}{2}, -2, \dfrac{-1 \pm \sqrt{37}}{6}$

c) $\dfrac{1}{2}, -2, \dfrac{5}{6}, \dfrac{-7}{6}$

d) None

5. Solving equation $(2x+3)(2x+5)(x-1)(x-2) = 30$ the roots available are
a) $0, \dfrac{1}{2}, -\dfrac{11}{4}, \dfrac{9}{4}$

b) $0, -\dfrac{1}{2}, \dfrac{-1 \pm \sqrt{105}}{4}$

c) $0, -\dfrac{1}{2}, -\dfrac{11}{4}, -\dfrac{9}{4}$

d) None

ROOTS

Synopsis :

Nature of Roots

i) If α and β are the roots of the equation $ax^2 + bx + c = 0$, then

Sum of roots $= \alpha + \beta = -b/a$

Product of roots $= \alpha\beta = c/a$

ii) An equation whose roots are α and β is given by

x^2 – (sum of the roots) x + (product of the root) = 0

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

Nature of Roots :

$\Delta = b^2 - 4ac$ (Discriminant) Value of $\Delta = b^2 - 4ac$	Nature of Roots
1) $b^2 - 4ac < 0$ 2) $b^2 - 4ac = 0$ 3) $b^2 - 4ac > 0$ 4) $b^2 - 4ac > 0$, perfect square 5) $b^2 - 4ac > 0$, not a perfect square	1) Real and Equal 2) Real and Unequal 3) Imaginary / Complex 4) Real, Unequal and Rational 5) Real, unequal, irrational & Conjugate of each other

Part - III
Nature of roots (Quadratic Equation)
Set – A

1.   If $b^2 - 4\,ac$ is a perfect square but not equal to
     zero than the roots are: *(Scanner)*
     a) real and equal
     b) real, irrational and equal
     c) real, rational and unequal
     d) Imaginary.

2.   If one root of $5x^2 + 13x + p = 0$ be reciprocal
     of the other then the value of p is
     a) -5   b)   5
     c) 1/5   d)   -1/5

3.   The equation $x^2 - (p+4)x + 2p + 5 = 0$ has equal
     roots the values of p will be.
     a) ± 1 b)   2
     c) ± 2 ,d)   -2

4.   If the roots of the equation $2x^2 + 8x - m^3 = 0$
     are equal then value of m is
     a) -3   b)   -1
     c) 1   d)   -2

5.   If the roots of the equation $4x^2 - 12x + k = 0$
     are equal, then the value of k is:
         (Scanner)

     a) -3   b)   3
     c) -9   d)   9

6.   The quadratic equation $x^2 - 2kx + 16 = 0$ will
     have equal roots when the value of 'k' is_____.
     (Scanner)
     a) $\cdot\cdot$ 1   b) $\cdot\cdot$ 2
     c) $\cdot\cdot$ 3   d) $\cdot\cdot$ 4

7.   If one root of the Equation $px^2 + qx + r = 0$ is r
     then other root of the Equation will be:*(Scanner)*
     a) 1/q   b)   1/r
     c) 1/p   d) $\dfrac{1}{p+q}$

8.   If $\alpha + \beta = -2$ and $\alpha\beta = -3$, then α, β are the
     roots of the equation, which is: *(Scanner)*
     a) $x^2 - 2x - 3 = 0$
     b) $x^2 + 2x - 3 = 0$
     c) $x^2 + 2x + 3 = 0$

d) $x^2 - 2x + 3 = 0$

9.   If one root of the equation is $2 - \sqrt{3}$ form the
     equation given that the roots are irrational
     a) $x^2- 4x + 1 = 0$ b) $x^2- 4x - 1 = 0$
     c) $x^2- 4x + 3 = 0$ d)   none of these

10. The equation $\left(\dfrac{l-m}{2}\right)x^2 - \left(\dfrac{l+m}{2}\right)x + m = 0$ has
     got two values of x to satisfy the equation
     given as

     a) $\left(1, \dfrac{2m}{l-m}\right)$ b) $\left(1, \dfrac{m}{l-m}\right)$

     c) $\left(1, \dfrac{2l}{l-m}\right)$ d) $\left(1, \dfrac{1}{l-m}\right)$

11. Solving equation $(b-c)x^2 + (c-a)x + (a-b) = 0$
     following roots are obtained

     a) $\dfrac{a-b}{b-c}, 1$ b)   (a-b) (a-c), 1

     c) $\dfrac{b-c}{a-b}, 1$ d)   None

Set – B

1.   If $\alpha\beta$ be the roots of the equation $2x^2 - 4x - 3$
     $= 0$ the value of $\alpha^2 + \beta^2$ is
     a) 5   b)   7
     c) 3   d)   -4

2.   Roots of equation $2x^2 + 3x + 7 = 0$ are α and
     β. The value of $\alpha\beta^{-1} + \beta\alpha^{-1}$ is   *(Scanner)*
     a) 2   b)   3/7
     c) 7/2   d)   -19/14

3.   If p and q are the roots of $x^2 + 2x + 1 = 0$ then
     the values of $p^3 + q^3$ becomes
     a) 2   b)   -2
     c) 4   d)   -4

4   If roots of equation $x^2 + x + r = 0$ are $'\alpha'$ and
     $'\beta'$ and $\alpha^3 + \beta^3 = -6$. Find the value 'r' ?
         (Scanner)

     a) $\dfrac{-5}{3}$ b) $\dfrac{7}{3}$

     c) $\dfrac{-4}{3}$ d)   1

5. If α and β be the roots of the quadratic equation $2x^2 - 4x = 1$, the value of $\dfrac{\alpha^2}{\beta}+\dfrac{\beta^2}{\alpha}$ is___. *(Scanner)*
   a) -11
   b) 22
   c) -22
   d) 11

6. Let α and β be the roots of $x^2 + 7x + 12 = 0$. Then the value of $\left(\dfrac{\alpha^2}{\beta}+\dfrac{\beta^2}{\alpha}\right)$ will be *(Scanner)*
   a) $\dfrac{7}{12}+\dfrac{12}{7}$
   b) $\dfrac{49}{144}+\dfrac{144}{49}$
   c) $-\dfrac{91}{12}$
   d) None of the above.

7. If one of the roots of the equation $x^2 + px + \underline{a}$ is $\sqrt{3}+2$, then the value of 'p' and '$\underline{a}$' is: *(Scanner)*
   a) -4, -1
   b) 4, -1
   c) -4, 1
   d) 4, 1

8. If α and β are the roots of the equation $x^2 + 7x + 12 = 0$, then the equation whose roots $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ will be: *(Scanner)*
   a) $x^2 - 14x + 49 = 0$
   b) $x^2 - 24x + 144 = 0$
   c) $x^2 - 50x + 49 = 0$
   d) $x^2 - 19x + 144 = 0$

9. When two roots of quadratic equation are α, $\dfrac{1}{\alpha}$ then what will be the quadratic equation: *(Scanner)*
   a) $ax^2 - (a^2 + 1)x + \alpha = 0$
   b) $ax^2 - a^2x + 1 = 0$
   c) $ax^2 - (\alpha^2 + 1)x + 1 = 0$
   d) None of these

10. The difference between the roots of the equation $x^2 - 7x - 9 = 0$ is: *(Scanner)*
    a) 7
    b) $\sqrt{85}$
    c) 9
    d) $2\sqrt{85}$

11. If the root of the equation $x^2-8x+m = 0$ exceeds the other by 4 then the value of m is
    a) m = 10
    b) m = 11
    c) m = 9
    d) m = 12

12. If α, β are the roots of equation $x^2-5x+6=0$ and $\alpha > \beta$ then the equation with roots $(\alpha+\beta)$ and $(\alpha-\beta)$ is
    a) $x^2-6x + 5 = 0$
    b) $2x^2-6x + 5 = 0$
    c) $2x^2-5x + 6 = 0$
    d) $x^2-5x + 6 = 0$

13. If α, β are the roots of equation $x^2-5x+6=0$ and $\alpha > \beta$ then the equation with roots $(\alpha^2+\beta)$ and $(\alpha+\beta^2)$ is
    a) $x^2-9x+99 = 0$
    b) $x^2-18x+90 = 0$
    c) $x^2-18x+77 = 0$
    d) None

14. If α, β are the roots of equation $x^2-5x+6=0$ and $\alpha > \beta$ then the equation with roots $(\alpha\beta-\alpha-\beta)$ and $(\alpha\beta + \alpha +\beta)$ is
    a) $x^2-12x+11=0$
    b) $2x^2-6x+12=0$
    c) $x^2-12x+12=0$
    d) None

15. If α and β be the roots of $x^2 + 7x + 12 = 0$ find the equation whose roots are $(\alpha+\beta)^2$ and $(\alpha-\beta)^2$.
    a) $x^2 - 50x - 49 = 0$
    b) $x^2 - 50x + 45 = 0$
    c) $x^2 + 50x - 49 = 0$
    d) $x^2 - 50x + 49 = 0$

16. Find the condition that one roots is double the other of $ax^2+bx + c = 0$ *(Scanner)*
    a) $2b^2 = 3ac$
    b) $b^2 = 3ac$
    c) $2b^2 = 9ac$
    d) $2b^2 > 9ac$

17. the condition that one of $ax^2+bx+c=0$ the roots of is twice the other is
    a) $b^2=4ca$
    b) $2b^2=9 (c+a)$
    c) $2b^2=9ca$
    d) $2b^2=9 (c-a)$

18. The condition that one of $ax^2 + bx + c = 0$ the roots of is thrice the other is
    a) $3b^2 = 16ca$
    b) $b^2 = 9ca$
    c) $3b^2 = -16ca$
    d) $b^2 = -9ca$

19. If the roots of $ax^2 + bx + c = 0$ are in the ratio $\dfrac{p}{q}$ then the value of $\dfrac{b^2}{(ca)}$ is

a) $\dfrac{(p+q)^2}{(pq)}$ b) $\dfrac{(p+q)}{(pq)}$

c) $\dfrac{(p-q)^2}{(pq)}$ d) $\dfrac{(p-q)}{(pq)}$

20. If α, β be the roots of $2x^2 - 4x - 1 = 0$ find the value of $\dfrac{\alpha^2}{\beta} + \dfrac{\beta^2}{\alpha}$

   a) 20   b) -22
   c) 15   d) none of these

21. If α and β are the roots of the equation $2x^2+5x +k = 0$, and $4 (\alpha^2 + \beta^2 + \alpha\beta) = 23$, then which of the following is true?
   a) $k^2+3k - 2 = 0$ b) $k^2 - 2k + 3 = 0$
   c) $k^2 - 2k - 3 = 0$ d) $k^2 - 3k + 2 = 0$

Set – C

1. If L + M + N = 0 and L, M, N are rationals the roots of the equation
   $(M + N - L)x^2 + (N + L - M) x + (L + M - N) = 0$
   are
   a) real and irrational   b) real and rational
   c) imaginary and equal   d) real and equal

2. The roots of the equation $x^2 + (2p-1)x + p^2 = 0$ are real if
   a) $p \geq 1$ b) $p \leq 4$
   c) $p \geq 1/4$ d) $p \leq 1/4$

3. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals then $\dfrac{b^2}{ac} + \dfrac{bc}{a^2}$ is equal to
   a) 2   b) -2
   c) 1   d) -1

4. If α, β are the two roots of the equation $x^2 - px + q = 0$ form the equation whose roots are $\dfrac{\alpha}{\beta}$ and $\dfrac{\beta}{\alpha}$.
   a) $qx^2-(p^2-2q)x+q=0$ b) $qx^2-(p^2+2q)x-q=0$
   c) $qx^2+(p^2-2q)x-q=0$ d) none of these

5. If one root is half of the other of a quadratic equation and the difference in root then the equation is
   a) $x^2 + ax + 2a^2 = 0$
   b) $x^3 - 3ax - 2a^3 = 0$
   c) $x^3 - 3ax + 2a^2 = 0$
   d) $x^2 + 3ax - 2a^2 = 0$

Set - D

D1. If the roots of the equation $p(q-r)x^2 + q(r-p)x + r(p - q) = 0$ are equal, then $\dfrac{1}{p} + \dfrac{1}{r} = ?$

   a) $\dfrac{1}{q}$ b) q

   c) 2q   d) $\dfrac{2}{q}$

D2. If $p \neq q$ and $p^2 = 5p - 3$ and $q^2 = 5q - 3$ the equation having roots as $\dfrac{p}{q}$ and $\dfrac{q}{p}$ is
   a) $x^2 - 19x + 3 = 0$ b) $3x^2 - 19x - 3 = 0$
   c) $3x^2 - 19x + 3 = 0$ d) $3x^2 + 19x + 3 = 0$

D3. If α and β are the roots of $x^2 = x + 1$ then value of $\dfrac{\alpha^2}{\beta} - \dfrac{\beta^2}{\alpha}$ is
   a) $2\sqrt{5}$ b) $\sqrt{5}$
   c) $3\sqrt{5}$ d) $-2\sqrt{5}$

CUBIC EQUATIONS

Synopsis :

1. **Meaning :** Equation in which the highest power is 3 is called cubic Equation. (Ex) : $ax^3 + bx^2 + cx + d = 0$ $(a \neq 0)$
   $x^3 - 2x^2 + x - 7 = 0$

2. **Solution to Simultaneous Equations :** For solving the Cubic Equation, find one root by Trial and Error Method and then reduce the cubic equation into quadratic equation by Synthetic Division method. The Quadratic Equation may further be dissolved into two further Linear Equations.

If $\alpha . \beta, \gamma$ are roots of a cubic equation $ax^3 + bx^2 + cx + d = 0$ then

1) Sum of roots = $\alpha + \beta + \gamma = -\frac{b}{a}$.

2) Sum of product of 2 roots taken at a time = $\alpha\beta + \beta r + \gamma r = \frac{c}{a}$.

3) Product of roots = $\alpha\beta . r = -\frac{d}{a}$.

Finding cubic equation using roots $\alpha . \beta, \gamma$. $x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \alpha\gamma)x - \alpha\beta\gamma = 0$.

Part - IV
Cubic Equations
<u>Set - A</u>

1. The solution of the cubic equation $x^3-6x^2+11x-6 = 0$ is given by the triplet:
   a) $(-1, 1, -2)$ b) $(1, 2, 3)$
   c) $(-2, 2, 3)$ d) $(0, 4, -5)$

2. The cubic equation $x^3 + 2x^2 - x - 2 = 0$ has 3 roots namely.
   a) $(1, -1, 2)$ b) $(-1, 1, -2)$
   c) $(-1, 2, -2)$ d) $(1, 2, 2)$

3. The roots of the equation $x^3 + 7x^2 - 21x - 27 = 0$ are
   a) $(-3, -9, -1)$ b) $(3, -9, -1)$
   c) $(3, 9, 1)$ d) $(-3, 9, 1)$

4. The satisfying value of $x^3 + x^2 - 20x = 0$ are
   a) $(1, 4, -5)$ b) $(2, 4, -5)$
   c) $(0, -4, 5)$ d) $(0, 4, -5)$

5. The roots of the cubic equation $x^3 + 7x^2 - 21x - 27 = 0$ are
   a) $(-3, -9, -1)$ b) $(3, -9, -1)$
   c) $(0, -4, 5)$ d) $(-3, 9, 1)$

6. The roots of the cubic equation $x^3 - 7x + 6 = 0$ are: *(Scanner)*
   a) 1, 2 and 3   b) 1, -2 and 3
   c) 1, 2 and -3   d) 1, -2 and -3

7. Solve $x^3 -5x^2-2x+24=0$ given that two of its roots being in the ratio of 3:4
   a) -2, 4, 3   b) -1, 4, 3
   c) 2, 4, 3   d) -2, -4, -3

8. Solve $x^3-6x^2+5x+12=0$ given that the product of the two roots is 12
   a) 1, 3, 4   b) -1, 3, 4
   c) 1, 6, 2   d) 1, -6, -2

9. Solve $x^3 + 3x^2-x-3=0$ given that the roots are in arithmetical progression
   a) -1, 1, 3
   b) 1, 2, 3
   c) -3, -1, 1

   d) -3, -2, -1

10. Solving $x^3 + 9x^2 -x-9=0$ we get the following roots
    a) ±1, -9   b) ±1, ±9
    c) ±1, 9   d) None

11. It is being given that one of the roots is half the sum of the other two solving $x^3-12x^2+47x-60=0$ we get the following roots:
    a) 1, 2, 3   b) 3, 4, 5
    c) 2, 3, 4   d) -3, -4, -5

12. Solve $x^3-7x^2+14x-8=0$ given that the roots are in geometrical progression
    a) ½, 1, 2   b) 1, 2, 4
    c) ½, -1, 2   d) -1, 2, -4

13. The rational root of the equation $2x^3 - x^2 - 4x + 2 = 0$ is
    a) $\dfrac{1}{2}$ b) $-\dfrac{1}{2}$
    c) 2   d) -2.

14. x, $x - 4$, $x + 5$ are the factors of the left-hand side of the equation.
    a) $x^3 + 2x^2 - x - 2 = 0$
    b) $x^3 + x^2 -20x = 0$
    c) $x^3 - 3x^2 - 4x + 12 = 0$
    d) $x^3 - 6x^2 11 x - 6 = 0$

15. The equation $3x^3 + 5x^2 = 3x + 5$ has got 3 roots and hence the factors of the left – hand side of the equation $3x^3 + 5x^2 - 3x - 5 = 0$ are
    a) $x - 1$, $x - 2$, $x - 5/3$ b) $x - 1$, $x + 1$, $3x + 5$
    c) $x + 1$, $x - 1$, $3x - 5$ d) $x - 1$, $x + 1$, $x - 2$

16. The value of 'K' is _____, if 2 is root of the following cubic equation : $x^3 - (k +1) x + k = 0$.
    a) 2   b) 6
    c) 1   d) 4

Set - B

1. The roots of $x^3 + x^2 - x - 1 = 0$ are
   a) (-1, -1, 1)   b) (1, 1, -1)
   c) (-1, -1, -1)   d) (1, 1, 1)

2. The roots of the equation $y^3 + y^2 - y - 1 = 0$ are:
   (Scanner)
   a) (1, 1, -1)   b) (-1, -1, 1)
   c) (1, 1, 1)   d) None of these

3. If $4x^3 + 8x^2 - x - 2 = 0$ then value of (2x+3) is given by
   a) 4, -1, 2   b) -4, 2, 1
   c) 2, -4, -1   d) none of these

4. If $x^3 - 6x^2 + 11x - 6 = 0$ then find the value of (3x – 4).   *(Scanner)*
   a) (1, 2, 3)   b) (-1, 2, 5)
   c) (-1, 3, 5)   d) (2, 3, 5)

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3. LINEAR INEQUATIONS

Synopsis :

The term 'programming' means 'planning' and it refers to a particular plan of action from amongst several alternatives for maximizing or minimizing a function under given restrictions as maximizing profit or minimizing cost, etc. The term 'linear means that 'all inequations' or equations used' and the function to be maximized or minimized are linear. Thus, linear programming is a technique for resource utilization.

Before starting Linear Programming Problems, we should know some terminology of Liner inequalition are given below.

Linear Inequalities

An inequality or inequation is said to be linear, if each variable occurs in first degree only and there is no term involving the product of the variables e.g., $ax + b \leq 0, ax + by + c > 0, ax \leq 4$ etc.

Linear Inequality in One Variable

A linear inequality or inequation, which has only one variable is called linear inequality or inequation in one variable e.g. $ax + b < 0$, where $a \neq 0, 3x + 4 > 0$.

Linear Inequality in Two Variables

A linear inequality, which has two variables is called linear inequality in two variables e.g. $3x + 11y \leq 0, 4t + 3s > 0$.

Concept of Half Planes

The graph of a line $ax + by + c = 0$ is a straight line which divides the cartesian plane or $xy-$ plane into two parts. Each part is known as half plane.

Types of Half Planes

i.   **Left and right half planes** A. vertical line will divide the plane in two parts, left half plane and right half plane.

ii.   **Lower and upper half planes** A non-vertical line will divide the $xy-$ plane into two parts, lower half plane and upper half plane.
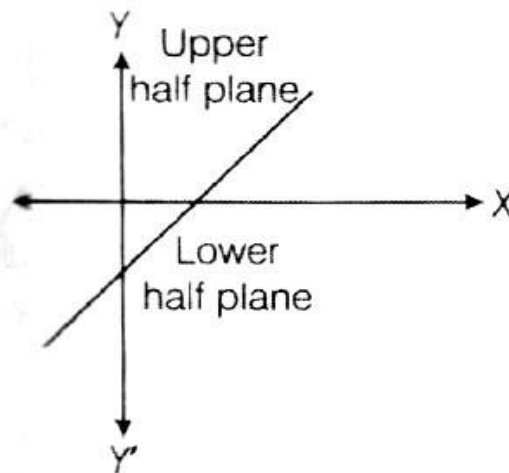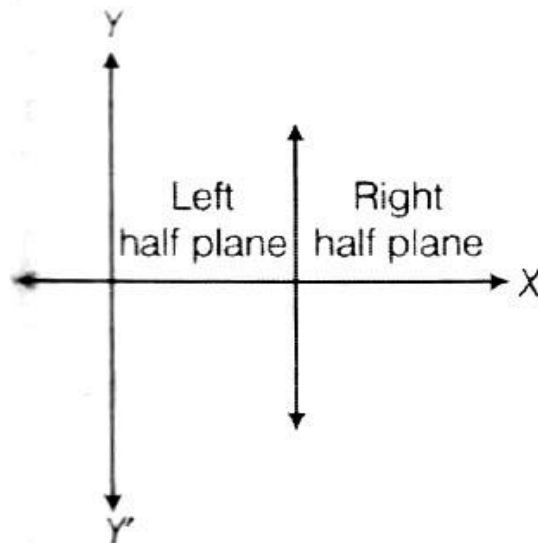
iii. **Closed half plane** A half place in $xy-$ plane is called a closed half plane. If the line separating the half plane is also included in the half plane.

Therefore, the graph of a linear inequality involving sign $\leq$ or $\geq$ is always closed half plane.

iv. **Open half plane** A half plane in $xy-$ plane called an open half plane, if the line separating the half plane is not included in the half plane.

Therefore, the graph of a linear inequality involving sign < or > is always an open half plane.

Solution of a Linear Inequality in Two Variables by Graphical Method

Suppose, given linear inequality is $ax+by\leq c,$ or $ax+by\geq c$ or $ax+by<c$ or $ax+by>c$ then for finding its solution by graphical method, we use the following steps:

i. Consider the equation $ax+by=c$ in place is given inequality, which represents a straight line in XY-plane.

ii. Identify the type of line.

iii. Obtain the shaded region by substituting angle point {preferable (0,0) or (1, 0)} which does not lie on the line in the equation.

iv. If there are multiple lines obtain the common shaded region i.e. feasible region.

Types of lines

Type	Standard Equation
1) X axis	Y = 0
2) Y axis	X = 0
3) Parallel to X – axis	by +c = 0 eg. : y =3, 2y-3 = 0
4) Parallel to Y – axist	ax +c = 0, eg : x = 2, 3x+5 = 0
5) Passing through origin	ax+by = 0, eg. : 2x+3y=0, x – y =0
6) Standard line	ax + by +c = 0, eg. : 2x+3y-6 = 0, 3x+4y + 8 = 0

NOTE : -

For Standard line we may use Doble Intercept form : =

$\frac{x}{A}+\frac{y}{B}=1$ Where A $\rightarrow$ x – intercept, B $\rightarrow$ y – intercept.

P1
One variable (direct)

1. If a > 0 and b < 0, it follows that : **(Scanner)**

   a) $\dfrac{1}{a} > \dfrac{1}{b}$ b) $\dfrac{1}{a} < \dfrac{1}{b}$

   c) $\dfrac{1}{a} = \dfrac{1}{b}$ d) None of these

2. When an Inequation is multiplied or divide by any negative number, inequation-direction.
   a) Changes   b) Does Not Change
   c) Either (a) or (b)   d) Neither (a) or (b)

3. - 6X < - 18 implies –
   a) X < 3   `   b) X > 3
   c) X = 0   d) X = 3

4. 4X > -16 implies –
   a) X greater than equal to -4
   b) X less than -4
   c) X greater than -4
   d) X less than equal to -4

5. If p – q = -3 then –
   a) p < q   b) p > q
   c) p = q   d) p = 0

6. X < -3 implies –
   a) -2X greater than 6   b) 2X greater than -6
   c) Both (a) or (b)   d) Neither (a) nor (b)

7. What is the smallest integer value of x that satisfies the inequality 4 – 3x < 11?
   a) -3   b) -2
   c) -1   d) 0

8. In the inequality 4x + 3 < 2x + 5, all of the following may be a value of 'x' except –
   a) 0   b) 1
   c) -1   d) -2

9. Find the range of real values of x satisfying the inequalities 3x – 2 > 7 and 4x – 13 > 15 **(Scanner)**
   a) x > 3   b) x > 7
   c) x < 7   d) x < 3

10. The solution set of the in equations x + 2 > 0 and 2x – 6 > 0 is **(Scanner)**
   a) (-2, ∞)   b) (3, ∞)
   c) (- ∞, -2)   d) (- ∞, -3)

11. The solution of the inequality 8x + 6 < 12x + 14 is:
   a) (-2, 2)   b) (0, -2)
   c) (2, ∞)   d) (-2, ∞)

12. The solution of the inequality $\dfrac{(5-2x)}{3} \le \dfrac{x}{6} - 5$ is **(Scanner)**
   a) x $\ge$ 8   b) x $\le$ 8
   c) x = 8   d) None of these

13. The Linear relationship between two variables in an inequality: **(Scanner)**
   a) ax + by $\le$ c   b) ax - by $\le$ c
   c) axy + by $\le$ c   d) ax + bxy $\le$ c

14. The sum of square of any real positive quantities and its reciprocal is never less than
   a) 1   b) 2
   c) 3   d) 4

P2
Graps (direct)
Section – B

1. The inequalities x $\ge$ 0, y$\ge$ 0 indicates –
   a) First quadrant   b) Second quadrant
   c) Third quadrant   d) Fourth quadrant

2. The inequalities x < 0, y > 0 represents –
   a) First quadrant   b) Second quadrant
   c) Third quadrant   d) Fourth quadrant

3. The inequalities $x_1 \ge 0$, $x_2 \ge 0$, are represented by one of the graphs shown below:

(a)   (b)

(c)   (d)

(a)   (b)

(c)   (d) none of these

4. The graph to express the inequality $x + y \leq 9$ is

(a)   (b)

(c)   (d) none of these

7. The region is expressed as
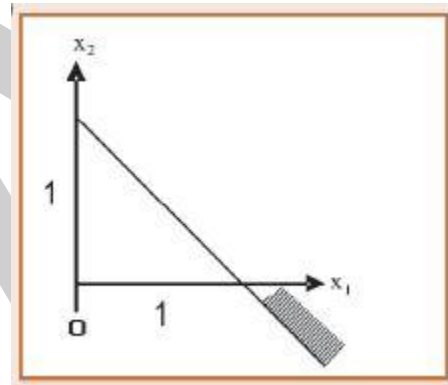
a) $x_1 - x_2 \geq 1$ b) $x_1 - x_2 \leq 1$
c) $x_1 + x_2 \geq 1$ d) None of these

5. The graph to express the inequality $x + y \leq 6$ is **(Scanner)**

(a)   (b)

(c)   (d) None of these.

8. The inequality $-x_1 + 2x_2 \leq 0$ is indicated on the graph as

(a)   (b)

(c)   (d) none of these

6. The graph to express the inequality $5x + 3y \geq 30$ is
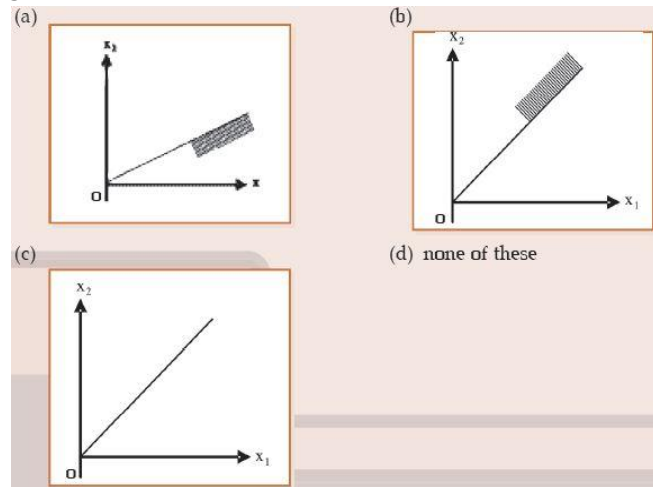
9. The graph to express the inequality $y \leq \left(\dfrac{1}{2}\right)x$ is indicated by

(a)   (b)   (c)   (d)
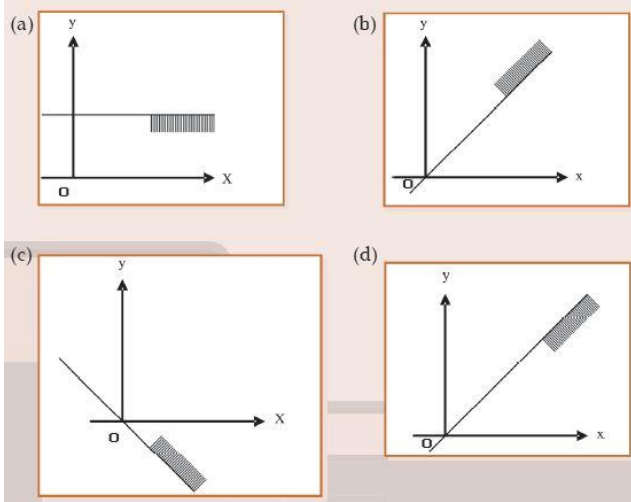
10. The shaded region represents: **(Scanner)**
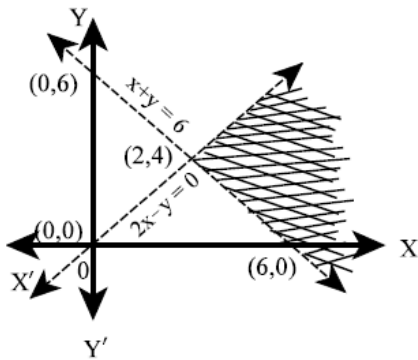
a) x + y > 6, 2x − y > 0
b) x + y < 6, 2x − y < 0
c) x + y > 6, 2x − y < 0
d) None of these

11. The common region of x + y ≤ 6; x + y ≥ 3; x ≥ 0; y ≥0, is (as shown by shaded region): **(Scanner)**
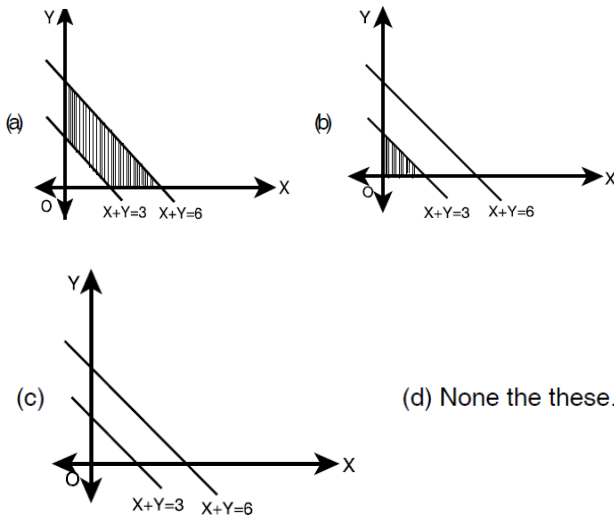
(a)   (b)   (c)   (d) None the these.

12. The common region by the inequalities $x_1 + 2x_2 \leq 5, x_1 + x_2 \geq 1, x_1 \geq 0, x_2 \geq 0$ is given as shaded portion in : **(Scanner)**

a)   (b)   c)   (d)
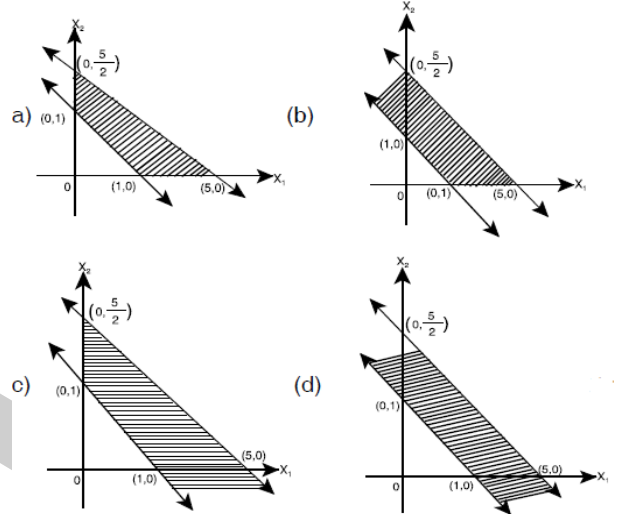
13. The common shaded region in the graph represents the linear inequalities as: **(Scanner)**
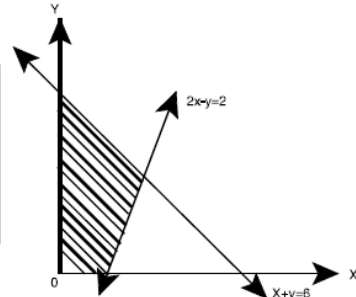
a) $x + y \geq 6, 2x - y - 2 \geq 0, x, y \geq 0$
b) $x + y \geq 6, 2x - y - 2 \leq 0, x, y \geq 0$
c) $x + y \leq 6, 2x - y - 2 \leq 0, x, y \geq 0$
d) $x + y \leq 6, 2x - y - 2 \geq 0, x, y \geq 0$

14. The shaded region represents : **(Scanner)**
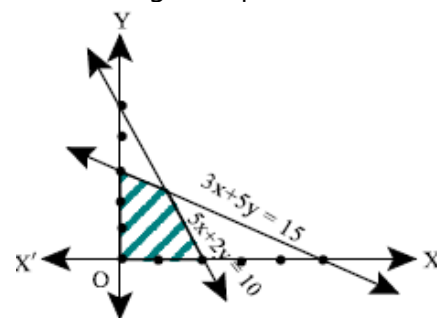
a) 3x + 5y ≤ 15, 5x + 2y ≥ 10, x, y ≥ 0
b) 3x + 5y ≤15, 5x + 2y ≤ 10, x, y ≥ 0
c) 3x + 5y ≥15, 5x + 2y ≥10, x, y ≥ 0
d) None of these.

Section – C

1. The shaded region represents: **(Scanner)**
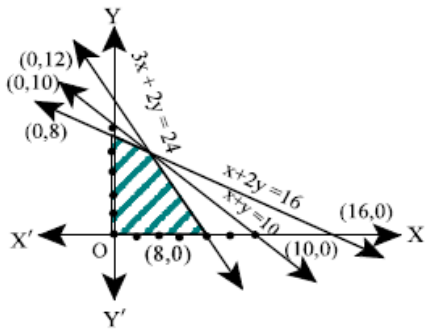
a) $3x + 2y \leq 24$, $x + 2y \geq 16$, $x + y \leq \cdot 10x$, $x \geq 0$, $y \geq 0$

b) $3x + 2y \leq 24$, $x + 2y \leq 16$, $x + y \geq \cdot 10$, $x \geq 0$, $y \geq 0$

c) $3x + 2y \leq 24$, $x + 2y \leq 16$, $x + y \leq 10$, $x \geq 0$, $y \geq 0$

d) None of these.

2. The shaded region represents: **(Scanner)**
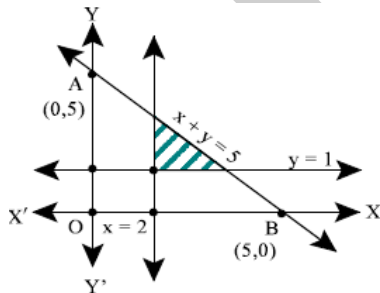
a) $x + y \leq 5$, $x \geq 2$, $y \leq 1$

b) $x + y \leq 5$, $x \geq 2$, $y \geq 1$

c) $x + y \geq 5$, $x \geq 2$, $y \geq 1$

d) None of these.

3. The common regions by the inequalities $4x + 3y \leq 60$, $y \geq 2x$; $x \geq 3$, $x \geq 0$ and $y \geq 0$ is **(Scanner)**

(a)

(b)

(c)
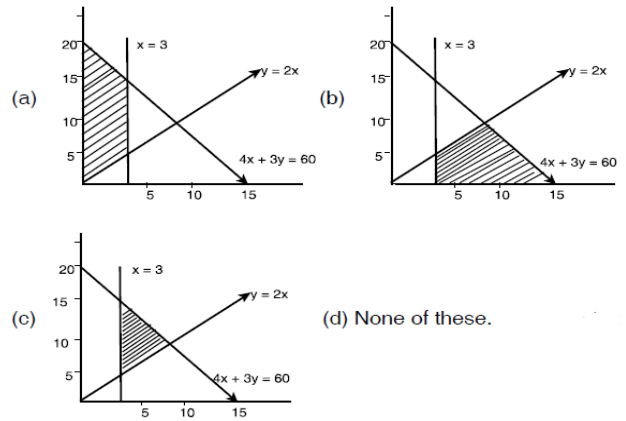
(d) None of these.

4. Draw the graphs of the following linear inequalities

$L_1 : 5x + 4y \leq 100, L_2 : 5x + y \geq 40,$

$L_3 : 3x + 5y \leq 75, \quad x \geq 0, \ y \geq 0$

and mark the common region
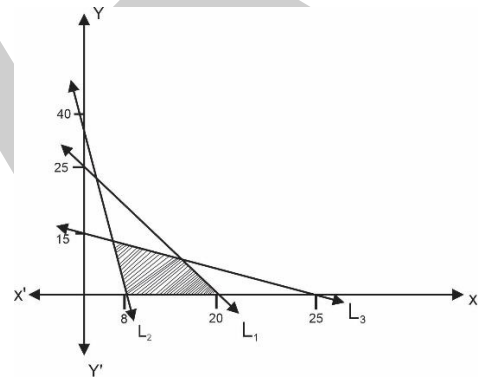
a)
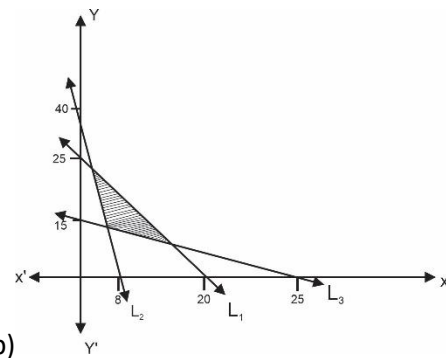
b)
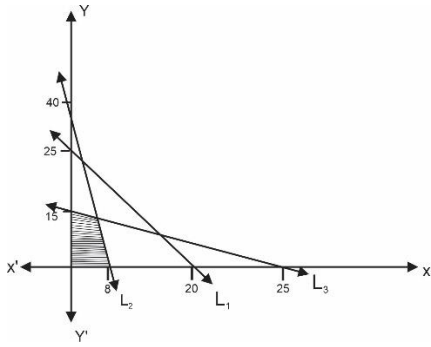
c)

d) None

5. Draw the graphs of the following linear inequalities:

$5x + 8y \le 2000, \; x \le 175, \; x \ge 0$

$7x + 4y \le 1400, \; y \le 225, \; y \ge 0$

and mark the common region
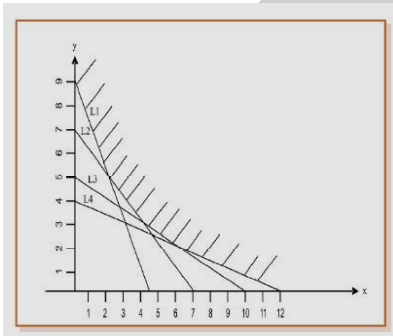
a)
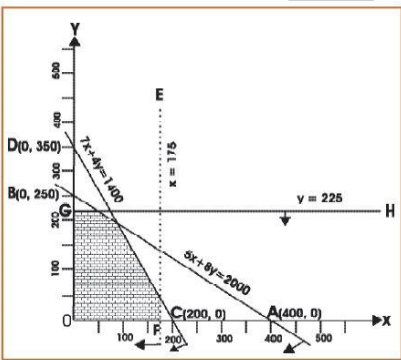
b)
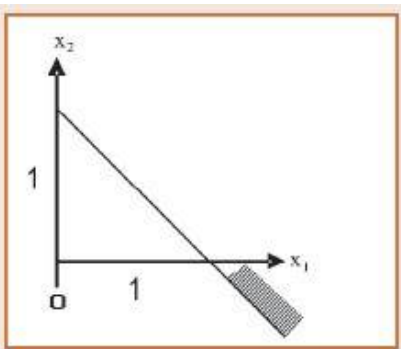
c)

d) None

6. Graphs of the inequations are drawn below
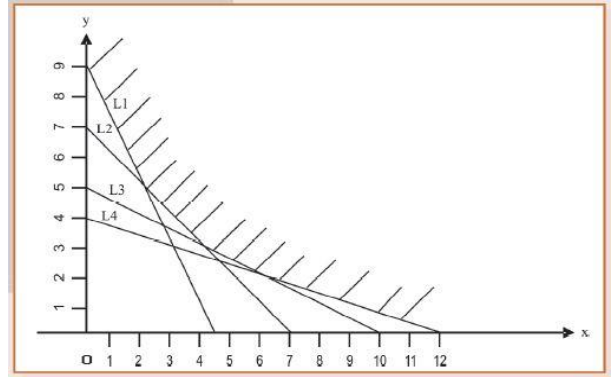
The common region (shaded part) indicated on the diagram is expressed by the set of inequalities

$L1: 2x + y = 9, \; L2: x + y = 7, \; L3: x + 2y = 10, \; L4: x + 3y = 12$

a)
$\begin{aligned} 2x + y &\le 9 \\ x + y &\ge 7 \\ x + 2y &\ge 10 \\ x + 3y &\ge 12 \end{aligned}$

b)
$\begin{aligned} 2x + y &\ge 9 \\ x + y &\le 7 \\ x + 2y &\ge 10 \\ x + 3y &\ge 12 \end{aligned}$

c)
$\begin{aligned} 2x + y &\ge 9 \\ x + y &\ge 7 \\ x + 2y &\ge 10 \\ x + 3y &\ge 12 \\ x &\ge 0, y \ge 0 \end{aligned}$

d) None of these

7. The common region satisfied by the inequalities

$L1: 3x + y \ge 6, \; L2: x + y \ge 4, \; L3: x + 3y \ge 6$ and $L4: x + y \le 6$ is indicated by

(a)

(b)

(c)
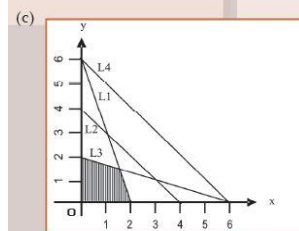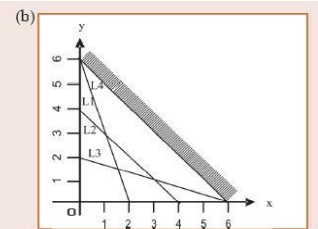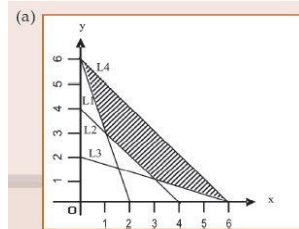
(d) none of these

8. The region indicated by the shading in the graph is expressed by the inequalities
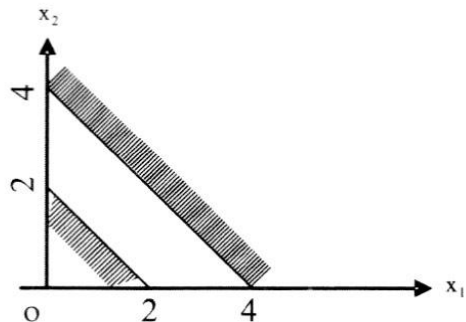
a) $x_1 + x_2 \leq 2,\ x_1 + x_2 \geq 4,\ x_1 \geq 0, x_2 \geq 0$
b) $x_1 + x_2 \leq 2,\ x_2 x_1 + x_2 \leq 0,\ x_1 \geq 0, x_2 \geq 0$
c) $x_1 + x_2 \geq 2,\ x_1 + x_2 \geq 4,\ x_1 \geq 0, x_2 \geq 0$
d) $x_1 + x_2 \leq 2,\ x_1 + x_2 > 4,\ x_1 \geq 0, x_2 \geq 0$

9. The set of inequalities
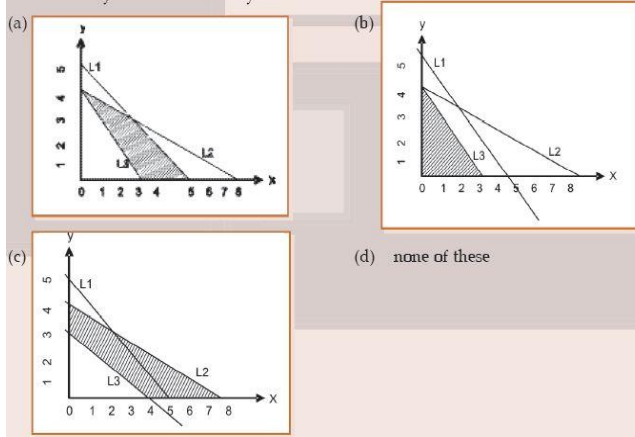$L1: x_1 + x_2 \leq 12,\ L2: 5x_1 + 2x_2 \leq 50,\ L3: x_1 + 3x_2 \leq 30,\ x_1 \geq 0, and\ x_2 \geq 0$
is represented by
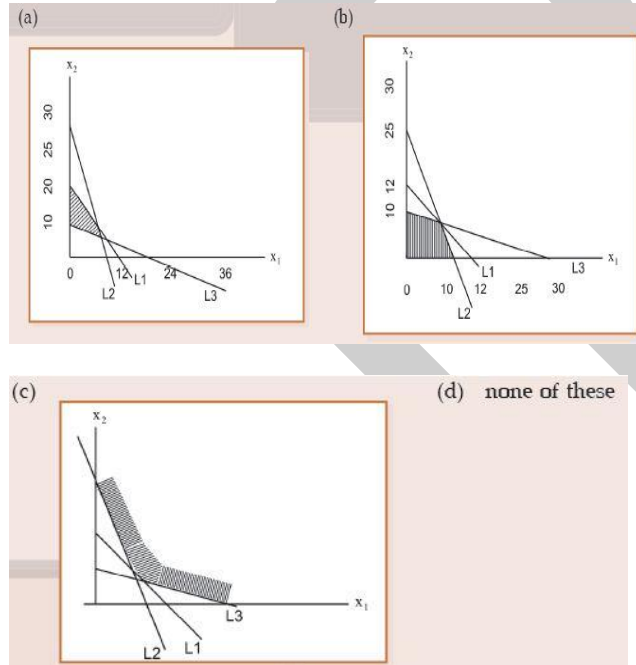
(d) none of these

10-. The common region satisfying the set of inequalities
$x \geq 0,\ y \geq 0, L1: x + y \leq 5, x + 2y \leq 8\ and\ L3: 4x + 3y \geq 12$
is indicated by

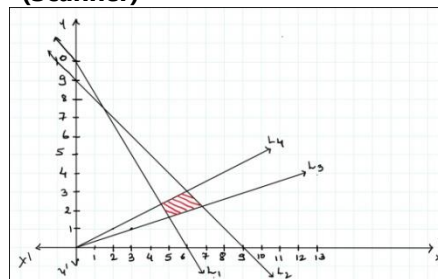(a)   (b)

(c)   (d) none of these

11.
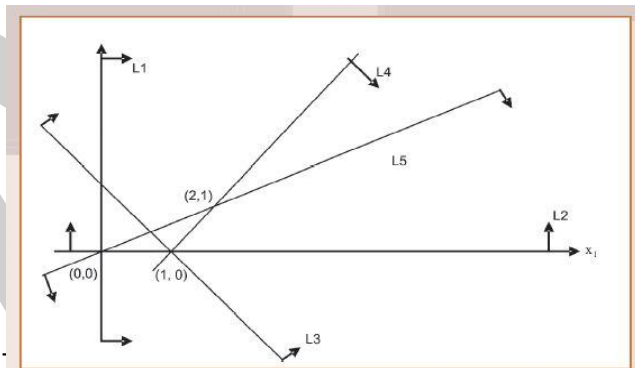
expressed by the set of five inequalities

a) $L1: x_1 \geq 0$
    $L2: x_2 \geq 0$
    $L3: x_1 + x_2 \leq 1$
    $L4: x_1 - x_2 \geq 1$
    $L5: -x_1 + 2x_2 \leq 0$

b) $L1: x_1 \geq 0$
    $L2: x_2 \geq 0$
    $L3: x_1 + x_2 \geq 1$
    $L4: x_1 - x_2 \geq 1$
    $L5: -x_1 + 2x_2 \leq 0$

c) $L1: x_1 \leq 0$
    $L2: x_2 \leq 0$
    $L3: x_1 + x_2 \geq 1$
    $L4: x_1 - x_2 \geq 1$
    $L5: -x_1 + 2x_2 \leq 0$

d) None of these

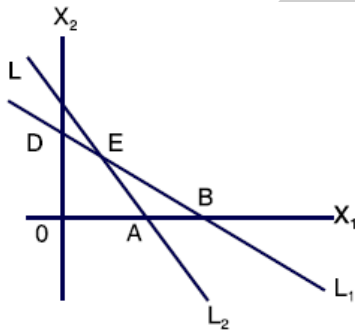12. Graphs of Inequations are drawn below:
     (Scanner)

$L_1 : 5x + 3y = 30$ $L_2 : x + y = 9$

$L_3 : y = \dfrac{x}{3}$ $L_4 : y = \dfrac{x}{2}$

The common region (shaded part) shown in the diagram refers to the inequalities: **(Scanner)**

a) $5x + 3y \leq 30$
    $x + y \leq 9$
    $y \leq \dfrac{1}{2}x$
    $y \leq x/2$
    $x \geq 0, y \geq 0$

b) $5x + 3y \geq 30$
    $x + y \leq 9$
    $y \geq x/3$
    $y \leq x/2$
    $x \geq 0, y \geq 0.$

c) $5x + 3y \geq 30$
    $x + y \geq 9$
    $y \leq x/3$
    $y \geq x/2$
    $x \geq 0, y \geq 0.$

d) $5x + 3y > 30$
    $x + y < 9$
    $y \geq 9$
    $y \leq x/2$
    $x \geq 0, y \geq 0.$

13. The common region represented by the following in equalities $L_1 = X_1 + X_2 < 4; L_2 = 2X_1 + X_2 > 6, x_1 \geq 0, x_2 \geq 0$ **(Scanner)**

a) OABC   b) Outside of OAB
c) Δ BCE   d) Δ ABE

14. The graph of linear inequalities $7x + 9y \leq 63, x + y \geq 1, 0 \leq x \leq 6$ and $0 \leq y \leq 5$
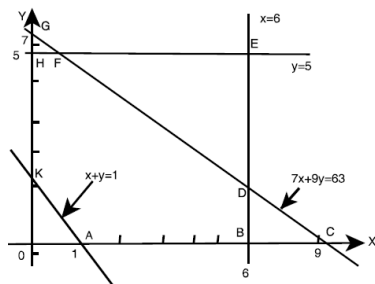
Common region of the inequalities is: **(Scanner)**

a) BCDB and DEFD   b) Unbounded
c) HFGH   d) ABDFHKA

15. On solving the inequalities $6x + y \geq 18, x + 4y \geq 12, 2x + y \geq 10$, we get the following situation:

a) (0, 18), (12, 0), (4, 2) & (2, 6)
b) (3, 0), (0, 3), (4, 2) & (7, 6)
c) (5, 0), (0, 10), (4, 2) & (7, 6)
d) (0, 18), (12, 0), (4, 2), (0, 0) and (7, 6)

16. On Solving the Inequalities $5x + y \leq 100, x + y \leq 60, x \geq 0, y \geq 0$, we get the following solution: **(Scanner)**

a) (0, 0), (20, 0), (10, 50) & (0, 60)
b) (0, 0), (60, 0), (10, 50) & (0, 60)
c) (0, 0), (20, 0), (0, 100) & (10, 50)
d) None of these

17. On solving the inequalities $2x + 5y \leq 20, 3x + 2y \leq 12, x \geq 0, y \geq 0$, we get the following situation

a) $(0,0), (0,4), (4,0) \, and \, (20/11, 36/11)$

b) $(0,0), (10,0), (0,6) \, and \, (20/11, 36/11)$

c) $(0,0), (0,4), (4,0) \, and \, (2,3)$

d) $(0,0), (10,0), (0,6) \, and \, (2,3)$

18. The common region in the graph of linear inequalities $2x + 2y \geq 18, x + y \geq 12 \, and \, 3x + 2y \leq 36$

a) Unbounded
b) infeasible
c) feasible and bounded
d) feasible and unbounded

19. Solution space of the inequalities $2x + y \leq 10$ and $x - y \leq 5$:
i) includes the origin.
ii) includes the point (4, 3)
    which one is correct? **(Scanner)**
a) Only (i)   b) Only (ii)
c) Both (i) and (ii)   d) None of the above.

P3
Word problems
Section - A

1. An employer recruits experienced (x) and fresh workmen (y) for his under the condition that he cannot employ more than 11 people. X and y can related by the inequality. **(Scanner)**
a) $x + y \neq 11$
b) $x + y \leq 11, x \geq 0, y \geq 0$

c) x + y ≥ 11, x ≥ 0, y ≥ 0   d) None of these

2. An employer recruits experienced (x) and fresh workmen (y) for his firm under the condition that he cannot employ more than 9 people. x and y can be related by the inequality
a) $x + y \neq 9$
b) $x + y \leq 9 \; x \geq 0, y \geq 0$
c) $x + y \geq 9 \; x \geq 0, y \geq 0$
d) None of these

3. On the average an experienced person does 7 units of work while a fresh one work 5 units of work daily but the employer has to maintain an output of at least 35 units of work per day. The situation can be expressed as: **(Scanner)**
a) 7x + 5y < 35
b) 7x + 5y ≤ 35
c) 7x + 5y > 35
d) 7x + 5y ≥ 35

4. On an average, experienced person does 5 units of work while a fresh person does 3 units of work daily but the employer has to maintain the output of at least 30 units of work per day. The situation can be expressed as. **(Scanner)**
a) 5x + 3y ≤ 30
b) 5x + 3y ≥ 30
c) 5x + 3y > 30
d) 5x + 3y = 30

5. The rules and regulations demand that the employer should employ not more than 5 experienced hands to 1 fresh one and this fact is represented by: (Taking experienced person as x and fresh person as y) **(Scanner)**
a) $y \geq \dfrac{x}{5}$
b) 5y≤ x
c) 5y > x
d) None

6. The union forbids employer to employ less than two experienced person (x) to each fresh person (y). This situation can be expressed as: **(Scanner)**
a) x ≤ y/2
b) y ≤ x/2
c) y ≥ x/2
d) None of these

7. XYZ Company has a policy for its recruitment as : it should not recruit more than eight men (x) to three women (y). How can this fact be expressed in inequality?
a) $3y \geq 8x$
b) $3y \leq x/8$
c) $8y \geq 3x$
d) $8y \leq 3x$

Section – B

1. A firm makes two types of products: Type A and Type B. the profit on product A is Nu. 20 each and that on product B is Nu. 30 each. Both types are processed on three machines M1, M2 and M3. The time required in hours by each product and total time available in hours per week on each machine are follows:

Machine	Product A	Product B	Available Time
M1	3	3	36
M2	5	2	50
M3	2	6	60

The constraints can be formulated taking x_1 = number of units A and x_2 = number of unit of B as

a)
$$x_1 + x_2 \leq 12$$
$$5x_1 + 2x_2 \leq 50$$
$$2x_1 + 6x_2 \leq 60$$

b)
$$3x_1 + 3x_2 \geq 36$$
$$5x_1 + 2x_2 \leq 50$$
$$2x_1 + 6x_2 \geq 60$$
$$x_1 \geq 0, x_2 \geq 0$$

c)
$$3x_1 + 3x_2 \leq 36$$
$$5x_1 + 2x_2 \leq 50$$
$$2x_1 + 6x_2 \leq 60$$
$$x_1 \geq 0, x_2 \geq 0$$

d)   None of these

2. A dietitian wishes to mix together two kinds of food so that the vitamin content of the mixture is at least 9 units of vitamin A, 7 units of vitamin B, 10 units of vitamin C and 12 units of vitamin D. The vitamin content per Kg. of each food is shown below.

	A	B	C	D
Food I	2	1	1	2
Food II	1	1	2	3

Assuming x units of food I is to be mixed with y units of food II the situation can be expressed as

a)
$$2x + y \leq 9$$
$$x + y \leq 7$$
$$x + 2y \leq 10$$
$$2x + 3y \leq 12$$
$$x > 0, y > 0$$

b)
$$2x + y \geq 30$$
$$x + y \leq 7$$
$$x + 2y \geq 10$$
$$x + 3y \geq 12$$

c)
$$2x + y \geq 9$$
$$x + y \geq 7$$
$$x + y \leq 10$$
$$x + 3y \geq 12$$

d)
$$2x + y \geq 9$$
$$x + y \geq 7$$
$$x + 2y \geq 10$$
$$2x + 3y \geq 12$$
$$x \geq 0, y \geq 0$$

3. A dietician wishes to mix together two kinds of food so that the vitamins content of the mixture is atleast 9 units of vitamin A, 7 units of vitamin B, 10 units of vitamin C, 12 units of vitamin D. The vitamin content per kg. of each food is shown in table. Assuming 'x' units of food I is to be mixed with 'y' units of food II the situation can be expressed as: **(Scanner)**

	A	B	C	D
Food I	2	1	1	2
Food II	1	1	2	3

a) 2x + y ≤ 9
    x + y ≤ 7
    x + 2y ≤ 10
    2x + 3y ≤ 12
    x > 0, y > 0

b) 2x + y ≥ 30
    x + y ≤ 7
    x + 2y ≥ 10
    2x + 3y ≥ 12
    x > 0, y > 0

c) 2x + y ≥ 9
    x + y ≥ 7
    x + 2y ≤ 10
    x + 3y ≤ 12
    x ≥ 0, y > 0

d) 2x + y ≥ 9
    x + y ≥ 7
    x + 2y ≥ 10
    2x + 3y ≥ 12
    x ≥ 0, y ≥ 0

4. A car manufacturing company manufactures cars of two types A and B. Model A requires 150 man-hours for assembling, 50 man hours for painting and 10 man-hours for checking and testing. Model B requires 60 man-hours for assembling, 40 man-hours for painting and 20 man-hours for checking and testing. There are available 30 thousand man-hours for assembling, 13 thousand man-hours for painting and 5 thousand man-hours for checking and testing. Express the above situation using linear inequalities. Let the company manufacture x units of type A model of car and y units of type B model of car. Then, the inequalities are: **(Scanner)**
    a) 5x + 2y ≥ 1000; 5x + 4y ≥ 1300,
        x + 2y ≤ 500; x ≥ 0, y ≥ 0,
    b) 5x + 2y ≤ 1000; 5x + 4y ≤ 1300,

        x + 2y ≥ 500; x ≥ 0, y ≥ 0,
    c) 5x + 2y ≤ 1000; 5x + 4y ≤ 1300,
        x + 2y ≤ 500; x ≥ 0, y ≥ 0,
    d) 5x + 2y = 1000; 5x + 4y ≥ 1300,
        x + 2y = 500; x ≥ 0, y ≥ 0,

5. A company produces two products A and B, each of which requires processing in two machines. The first machine can be used at most for 60 hours, the second machine can be used at most for 40 hours. The product A requires 2 hours on machine one and one hour on machine two. The product B requires one hour on machine one and two hours on machine two. Express above situation using linear inequalities.
    a) $2x + y \leq 60, 2x + y \leq 40$
    b) $2x + y < 60, x + 2y < 40$
    c) $2x + y \geq 60, x + 2y \geq 40$
    d) $2x + y \leq 60, x + 2y \leq 40$

6. A Fertilizer company produces two types of fertilizers called grade I and grade II. Each of these types is processed through two critical chemical plant units. Plant A has maximum of 120 hours available in a week and plant B has maximum of 180 hours available in a week. Manufacturing one bag of grade I fertilizer requires 6 hours in plant A and 4 hours in plant B. manufacturing one bag of grade II fertilizer requires 3 hours in plant A and 10 hours in plant B. Express this using linear inequalities.
    a) $6x + 3y \leq 120, 4x + 10y < 180$
    b) $6x + 3y < 120, 4x + 10y \leq 180$
    c) $6x + 3y \leq 120, 4x + 10y \geq 180, x \geq 0, y \geq 0$
    d) $6x + 3y \leq 120, 4x + 10y \leq 180, x \geq 0, y \geq 0$

Section – C

1. A manufacturer produces two products A and B, and has his machines in operation for 24 hours a day. Production of A requires 2 hours of processing in machine M_1, and 6 hours in machine M_2 Production of B requires 6 hours of processing in machine M_1 and 2 hours in

machine M_2. The manufacturer earns a profit of Rs.5 on each unit of A and Rs. 2 on each unit of B. How many units of each product should be produced in a day in order to achieve maximum profit?

a) 2, 4   b) 0, 6

c) 3, 3   d) 12, 0

2. Two machines (I and II) produce two grades of plywood, grade A and grade B. In one hour of operation machine I produces two units of grade A and one unit of grade B, while machine, II, in one hour of operation produces three units of grade A and four units of grade B. The machines are required to meet a production schedule of at least fourteen units of grade A and twelve units of grade B. Express this using linear inequalities and draw the graph.

a)

b)

c)

d)
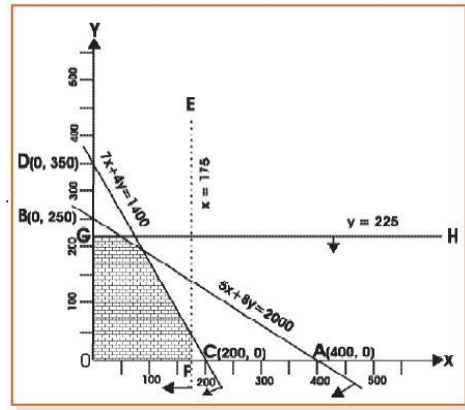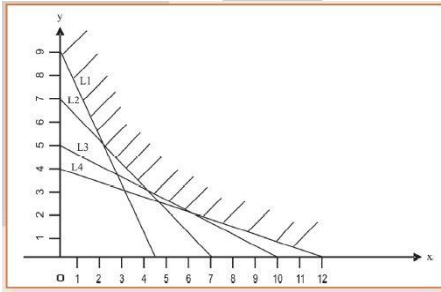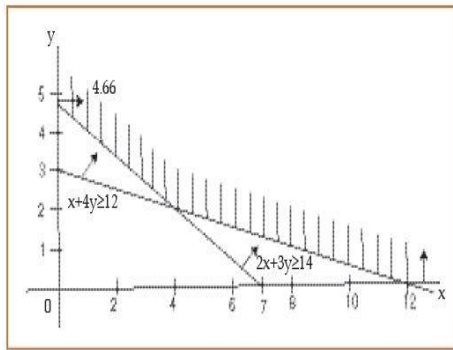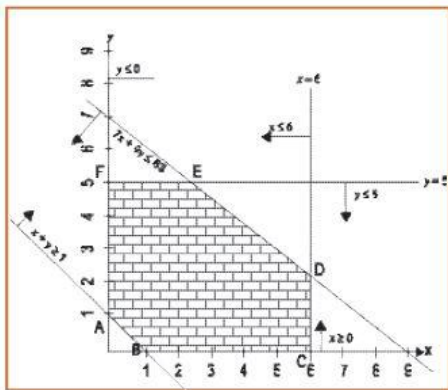
4A. TIME VALUE OF MONEY

Synopsis

Simple Interest :-

- S. I $= \frac{P.r.t}{100}, i = \frac{r}{100}$
- S. I = Pit.
- P $\rightarrow$ Principal (Starting amount)
- R $\rightarrow$ Rate of Interest p.a. (i.e. per annum)
- T$\rightarrow$ Time period in years.
- A = P + S. I. = P (1+ it).
- A $\rightarrow$ Accumulated value

In Simple Interest, interest remains same each year. i.e. Interest is calculated uniformly on the original principal throughout the period.

Compound Interest :-

A = P $(1 + i)^n$

C.I = A − P

C. I. = P $(1+i)^n$ − P = P $[(1+i)^n$ -1]

- In compound Interest we get interest on interest also.
- In compound Interest the interest of each year is always greater than the interest of previous year.

Effective Rate of Interest :- The stated rate is called as Nominal rate. If the compounding is performed more than once then we get effectively greater than the nominal rate and it is called as effective rate of Interest.

If r $\rightarrow$ nominal rate, $i = \frac{r}{100}$.

m $\rightarrow$ no. of times compounding in a year

r_e $\rightarrow$ effective rate

$$r_e = \left[\left(1 + \frac{r}{m}\right)^m - 1\right] \times 100$$

- Please note effect rate is not dependent on the Principle, (i.e. investment amount).

Part - I
Simple Interest
(Module+Scanner)
Set - A

1. How much interest will be earned on Rs.2000 at 6% simple interest for 2 years?
    a) Rs.240   b) Rs.200
    c) Rs.220   d) None

2. Sania deposited Rs.50,000 in a bank for two years with the interest rate of 5.5% p.a. How much interest would she earn?
    a) Rs.5,400   b) Rs.5,500
    c) Rs.4,400   d) None

3. S.I on Rs.3,500 for 3 years at 12% per annum is
    a) Rs.1,200   b) Rs.1,260
    c) Rs.2,260   d) None of these

4. Simple interest on Rs.2,000 for 5 months at 16% p.a. is ____.   *(Scanner)*
    a) Rs.133.33   b) Rs.133.26
    c) Rs.134.00   d) Rs.132.09

5. Sachin deposited Rs.1,00,000 in his bank for 2 years at simple interest rate of 6%. How much would be the final value of deposit?
    a) Rs.1,10,000   b) Rs.1,11,000
    c) Rs.1,15,000   d) Rs.1,12,000

6. Sania deposited Rs.50,000 in a bank for two years with the interest rate of 5.5% p.a. What will be the final value of investment ?
    a) Rs.50,550   b) Rs.55,400
    c) Rs.55,500   d) None

7. Find the rate of interest if the amount owed after 6 months is Rs.1050, borrowed amount being Rs.1000.
    a) 10%   b) 15%
    c) 20%   d) None

8. Rahul invested Rs.70,000 in a bank at the rate of 6.5% p.a. simple interest rate. He received Rs.85,925 after the end of term. Find out the period for which sum was invested by Rahul.
    a) 4.5 yrs   b) 3.5 yrs
    c) 5.5 yrs   d) None

9. P = 5,000, R = 15, T = 4 ½ using I = PRT/100, I will be
    a) Rs.3,375   b) Rs.3,300
    c) Rs.3,735   d) none of these

10. If P = 5,000, T = 1, I = Rs.300, R will be
    a) 5%   b) 4%
    c) 6%   d) none of these

11. P = Rs.10,000, I = Rs.2,500, R = 12 ½ % SI. The number of years T will be
    a) 1 ½ years   b) 2 years
    c) 3 years   d) none of these

12. How much investment is required to yield an Annual income of Rs.420 at 7% p.a. Simple interest.   *(Scanner)*
    a) Rs.6,000   b) Rs.6,420
    c) Rs.5,580   d) Rs.5,000

13. What sum of money will produce Rs. 42,800 as an interest in 3 years and 3 months at 2.5% p.a. simple interest?
    a) Rs. 3,78,000   b) Rs. 5,26,769
    c) Rs. 4,22,000   d) Rs. 2,24,000

14. In how many years will a sum of money become four times at 12% p.a. simple interest?
                              (Scanner)
    a) 18 years   b) 21 years
    c) 25 years   d) 28 years

15. In how many years will a sum of money become four times at 25% p.a. simple interest?
    a) 8   b) 12
    c) 16   d) 20

16. If a sum triples in 15 years at simple rate of interest, the rate of interest per annum will be: *(Scanner)*
    a) 13.0%   b) 13.3%
    c) 13.5%   d) 18.0%

17. In how much time would the simple interest on a certain sum be 0.125 times the principal at 10% per annum?   *(Scanner)*
    a) $1\frac{1}{4}$ years   b) $1\frac{3}{4}$ years

c) $2\frac{1}{4}$ years   d) $2\frac{3}{4}$ years

18. Find the numbers of years in which a sum doubles itself at the rate of 8% per annum.
    (Scanner)

    a) $11\frac{1}{2}$ b) $12\frac{1}{2}$

    c) $9\frac{1}{2}$ d) $13\frac{1}{2}$

19. The sum required to earn a monthly interest of Rs.1,200 at 18% per annum SI is
    a) Rs.50,000   b) Rs.60,000
    c) Rs.80,000   d) none of these

20. What principal will amount to Rs.370 in 6 years at 8% p.a. at simple interest? *(Scanner)*
    a) Rs.210   b) Rs.250
    c) Rs.310   d) Rs.350

21. P = Rs.12,000, A = Rs.16,500, T = 2 ½ years. Rate percent per annum simple interest will be
    a) 15%   b) 12%
    c) 10%   d) none of these

22. In what time will Rs.85,000 amount to Rs.1,57,675 at 4.5% p.a.?
    a) 19 yrs   b) 22 yrs
    c) 18 yrs   d) None

23. Kapil deposited some amount in a bank for 7 ½ years at the rate of 6% p.a. simple interest. Kapil received Rs.1,01,500 at the end of the term. Compute initial deposit of Kapil.
    a) Rs.60,000   b) Rs.70,000
    c) Rs.55,000   d) None

24. The ratio of simple interest earned by certain amount at the same rate of interest for 5 years and that for 9 year is
    a) 5 : 9   b) 9 : 5
    c) 5 : 4   d) 4 : 5

Set – B

1. A sum of Rs.46,875 was lent out at simple interest and at the end of 1 year 8 months the total amount was Rs.50,000. Find the rate of interest percent per annum.
   a) 4%   b) 5%
   c) 6%   d None

2. A sum of money amount to Rs.6,200 in 2 years and Rs.7,400 in 3 years. The principal and rate of interest are
   a) Rs.3,800, 31.57%   b) Rs.3,000, 20%
   c) Rs.3,500, 15%   d) none of these

3. What sum of money will produce Rs.28,600 as an interest in 3 years and 3 months at 2.5% p.a. simple interest?
   a) Rs.3,50,000   b) Rs.3,55,000
   c) Rs.3,52,000   d) None

4. If the Simple Interest on Rs.1,400 for 3 years is less than the simple interest on Rs.1,800 for the same period by Rs.80, then the rate of interest is   *(Scanner)*
   a) 5.67%   b) 6.67%
   c) 7.20%   d) 5.00%

5. If the simple interest on Rs. 2,000 for 3 years is less than the simple interest on Rs. 3,800 for the same period by Rs. 324, then the rate of interest is
   a) 4%   b) 7%   c) 6%   d) 10%

6. A person lends Rs.6,000 for 4 years and Rs.8,000 for 3 years at simple interest, If he gets Rs.2,400 as total interest, the rate of interest is:
   (Scanner)
   a) 5%   b) 4%   c) 6%   d) 7%

7. A certain sum of money Q was deposited for 5 year and 4 months at 4.5% simple interest and amounted to Rs.248, then the value of Q is
   (Scanner)
   a) Rs.200   b) Rs.210
   c) Rs.220   d) Rs.240

8. The certain sum of money became Rs.692/- in 2 yrs and Rs.800/- in 5 yrs then the principle amount is _____   *(Scanner)*
   a) Rs.520   b) Rs.620
   c) Rs.720   d) Rs.820

9. Rs.8,000 becomes Rs.10,000 in two years at simple interest. The amount that will become

Rs.6,875 in 3 years at the same rate of interest is: *(Scanner)*
a) Rs.4,850
b) Rs.5,000
c) Rs.5,500
d) Rs.5,725

10. Rs. 8,000 necp,es Rs. 10,000 in four years at simple interest. The amount that will become Rs. 4,125 in 6 years at the same rate of interest is:
a) 2500
b) 2900
c) 3300
d) 3000

11. What is the rate of simple interest if a sum of money amounts to Rs.2,784 in 4 years and Rs.2,688 in 3 years? *(Scanner)*
a) 1% p.a.
b) 4% p.a.
c) 5% p.a.
d) 8% p.a.

12. A certain sum of money amounts to Rs.6,300 in two years and Rs.7,875 in three years nine months at simple interest. Find the rate of interest per annum: *(Scanner)*
a) 20%
b) 18%
c) 15%
d) 10%

13. A sum of money doubles itself in 10 years. The number of years it would treble itself is: *(Scanner)*
a) 25 years
b) 15 years
c) 20 years
d) None

14. A sum of money doubles itself in 10 years. The number of years it would be eight times of itself is
a) 30yrs
b) 45 yrs
c) 70 yrs
d) None of these

15. A sum of money doubles itself in 6 years at simple interest. The number of years it would be eight times of itself
a) 18
b) 42
c) 36
d) 48

16. The S.I. on a sum of money is $\frac{4}{9}$ of the principal and the no. of years is equal to the rate of interest per annum. Find the rate of interest per annum? *(Scanner)*
a) 5%
b) 20/3%

c) 22/7%
d) 6%

17. The simple interest on a sum of money is ninth part of principal. If the rate percent and time are equal then their values are
a) $\left(3\frac{1}{3}, 3\frac{1}{3}\right)$
b) $\left(3\frac{2}{3}, 3\frac{2}{3}\right)$
c) $\left(2\frac{1}{3}, 3\frac{1}{3}\right)$
d) None of these

Set –C

1. P = Rs.8,500, A = Rs.10,200, R = 12 ½ % SI, t will be.
a) 1 yr. 7 mth.
b) 2 yrs.
c) 1 ½ yr.
d) none of these

2. Two equal sums of money were lent at simple interest at 11% p.a. for $3\frac{1}{2}$ years and $4\frac{1}{2}$ years respectively.If the difference in interests for two periods was Rs.412.50, then each sum is: *(Scanner)*
a) Rs.3,250
b) Rs.3,500
c) Rs.3,750
d) Rs.4,350

3. A person borrows Rs.5,000 for 2 years at 4% p.a. simple interest. He immediately lends to another person $6\frac{1}{4}$% p.a. simple interest for 2 years. Find his gain in the transaction per year: *(Scanner)*
a) Rs.112.50
b) Rs.125
c) Rs.225
d) Rs.167.50

4. The rate of simple interest on a sum of money is 6% p.a. for first 3 years, 8% p.a. for the next five years and 10% p.a. for the period beyond 8 years. If the simple interest accrued by the sum for a period for 10 years is Rs.1,560. The sum is: *(Scanner)*
a) Rs.1,500
b) Rs.2,000
c) Rs.3,000
d) Rs.5,000

5. The difference in simple interest of a sum invested of Rs.1,500 for 3 years is Rs.18. The difference in their rates is: *(Scanner)*
a) 0.4%
b) 0.6%
c) 0.8%
d) 0.10%

6. Mr. X invests Rs.90,500 in post office at 7.5% p.a. simple interest. While calculating the rate was wrongly taken as 5.7% p.a.The difference in amounts at maturity is Rs.9,774. Find the period for which the sum was invested: *(Scanner)*
    a) 7 years   b) 5.8 years
    c) 6 years   d) 8 years

7. A certain sum of money was invested at simple rate of interest for three years. If the same has been invested at a rate that was seven percent higher, the interest amount would have been Rs.882 more. The amount of sum invested is: *(Scanner)*
    a) Rs.12,600   b) Rs.6,800
    c) Rs.4,200   d) Rs.2,800

8. A certain sum ammounts to Rs. 15,748 in 3 years at simple interest rate of r% and the same sum amounts to Rs. 16,510 at (r+2)% p.a. simple interest in the same time. What is the value of r
    a) 6%   b) 8%
    c) 10%   d) 12%

9. A man invests Rs.12,000 at 10% p.a. and another sum of money at 20% p.a. for one year. The total investment earns at 14% p.a. simple interest the total investment is: *(Scanner)*
    a) Rs.8,000   b) Rs.20,000
    c) Rs.14,000   d) Rs.16,000

10. In simple interest if the principal is Rs.2,000 and the rate and time are the roots of the equation $x^2 - 11x + 30 = 0$ then simple interest is *(Scanner)*

    a) Rs.500   b) Rs.600
    c) Rs.700   d) Rs.800

11. A person invests certain amount in three different investment plans P, Q and R with the rate of interest 10%, 12% and 15% per annum respectively. If the total interest accrued in 1 year is 3,200 and the amount invested in plan R is 150% of the amount invested in plan P and 240% of the amount invested in plan Q then the amount invested in plan Q is
    a) 8000   b) 7000
    c) 6000   d) 5,000

Part - II
Compound Interest
Set - A

1. Earning interest on interest is called
    a) Extra Interest   b) Simple interest
    c) Inflation Interest d) Compound Interest

2. Rs.2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done annually?
    a) Rs.2,450.   b) Rs.2,340.
    c) Rs.2,420   d) None

3. Rs.2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Semi-annually?
    a) Rs.2,440   b) Rs.2,431
    c) Rs.2,435   d) None

4. Rs.2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Quarterly?
    a) Rs.2,436.80   b) Rs.2,340.75
    c) Rs.2,430.58   d) None

5. Rs.2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done monthly?
    a) Rs.2,450.58   b) Rs.2,340.55
    c) Rs.2,440.58   d) None

6. Saina deposited Rs.1,00,000 in a nationalized bank for three years. If the rate of interest is 7% p.a., calculate the interest that bank has to pay to Saina after three years if interest is compounded annually.
    a) Rs.1,20,504.30   b) Rs.22,504.30
    c) Rs.1,22,505.25   d) Rs.1,21,504.30

7. Saina deposited Rs.1,00,000 in a nationalized bank for three years. If the rate of interest is 7% p.a., calculate the final amount that bank has to pay to Saina after three years if interest is compounded annually.
   a) Rs.1,20,504.30   b) Rs.1,22,504.30
   c) Rs.1,22,505.25   d) Rs.1,21,504.30

8. You invest $800 in an account that pays 6% compound interest annually. How much money do you have after five years? Round your answers to the nearest cent.
   a) $898.09   b) $1070.58
   c) $1710.58   d) $975.25

9. Compute the compound interest on Rs.4,000 for 1½ years at 10% per annum compounded half-yearly.
   a) Rs.530.45   b) Rs.635.30
   c) Rs.630.50   d) None

10. katie invested $6,500 in a savings account earning 12% interest compounded quarterly. What is the future value of this investment after five years? Round your answer to the nearest cent.
    a) $1,235,322.65   b) $6,895.83
    c) $11,739.72   d) $6,901.32

11. A sum of money compounded annually becomes Rs.1,140 in two years and Rs.1,710 in three years. Find the rate of interest per annum.   *(Scanner)*
    a) 30%   b) 40%
    c) 50%   d) 60%

12. A sum of money compounded annually ecomes Rs. 1,200 in two years and Rs. 1,500 three years. Find the rate of interest per annum.
    a) 50%   b) 25%
    c) 30%   d) 20%

13. A sum amount to Rs.1,331 at a principal of Rs.1,000 at 10% compounded annually. Find the time.   *(Scanner)*
    a) 3.31 years   b) 4 years
    c) 3 years   d) 2 years

14. In what time will Rs.3,90,625 amount to Rs.4,56,976 at 8% per annum, when the interest is compounded semi-annually?[Given : $(1.04)^4 = 1.16986$]   *(Scanner)*
    a) 2 years   b) 4 years
    c) 5 years   d) 7 years

15. On what sum will the compound interest at 5% per annum for two years compounded annually be Rs.1,640?
    a) Rs.15,000.   b) Rs.14,000
    c) Rs.17,000   d) Rs.16,000

16. In what time will Rs.8,000 amount to Rs.8,820 at 10% per annum interest compounded half-yearly?
    a) 4 yrs   b) 2 yrs
    c) 5 yrs   d) None

17. Find the rate percent per annum if Rs.2,00,000 amount to Rs.2,31,525 in 1½ year interest being compounded half-yearly.
    a) 16%   b) 5%
    c) 10%   d) None

18. If Rahul deposites 20,000 in a bank and it Pays Quarterly compounded interest then the amount after 2 years is 23,433
    a) 2% p.a.   b) 4% p.a.
    c) 8.25 p.a.   d) 8% p.a.

19. Mr. X borrowed Rs.5,120 at 12 ½ % p.a C.I. At the end of 3 yrs, the money was repaid along with the interest accrued. The amount of interest paid by him is
    a) Rs. 2,100   b) Rs.2,170
    c) Rs. 2,000   d) none of these

20. a = Rs.5,200, R = 5% p.a., T = 6 years, P will be
    a) Rs.2,000   b) Rs.3,880
    c) Rs.3,000   d) none of these

21. The present value of Rs.10,000 due in 2 years at 5% p.a. compound interest when the interest is paid on yearly basis is Rs.____.
    a) 9,070   b) 9,060
    c) 9,080   d) None

22. What is the present value of Rs 10,000 to be received in year 10 at an interest rate of 10%?
    a) RM 4,855.43   b) RM 5,855.43
    c) RM 3, 855.43   d) RM 6, 855.43

23. Find the present value of Rs. 1,00,000 be required after 5 years if the rate of interest is 9% given that $(1.09)^5 = 1.5386$
    a) 78,995.98   b) 64, 994.20
    c) 88,992.43   d) 93,902.12

24. If the desired future value after 5 years with 18% interest rate is Rs. 1,50,000, then the present value (in Rs.) is (given that $(1.19)^5 = 2.2877$)
    a) 63, 712   b) 65,568
    b) 53,712   d) 41,712

25. Mr. X bought an electronic item for Rs.1,000. What would be the future value of the same item after 2 years, if the value is compounded semi annually at 22% per annum?   *(Scanner)*
    a) Rs.1,488.40   b) Rs.1,518.07
    c) Rs.2,008.07   d) Rs.2,200.00

26. A certain sum invested at 4% per annum compounded semi-annually amounts to Rs.78,030 at the end of one year. Find the sum.
    a) Rs.75,000   b) Rs.77,000
    c) Rs.80,000   d) None

27. How much must you deposit today in a bank account paying interest compounded quarterly if you wish to have $30,000 at the end of 3 months, if the bank pays 6% annual rate?
    a) $28,689.51   b) $29,556.65
    c) $9,851.49   d) $25,188.58

28. Rs.16,000 invested at 10% p.a. compounded semi-annually amounts to Rs.18,522. Find the time period of investment.
    a) 5 yrs   b) 3 yrs
    c) 8 yrs   d) 1.5 yrs

29. If P = Rs.1,000, R = 5% p.a, n = 4; What is Amount and C.I. is
    a) Rs.1,215.50, Rs.215.50 b) Rs.1,125, Rs.125
    c) Rs.2,115, Rs.115 d) none of these

30. Rs.100 will become after 20 years at 5% p.a. compound interest amount of
    a) Rs.250   b) Rs.205
    c) Rs.265   d) none of these

31. If A = Rs.1,000, n = 2 years, R = 6% p.a. compound interest payable half-yearly, then principal (P) is
    a) Rs.889   b) Rs.880
    c) Rs.895   d) none of these

32. The C.I on Rs.16000 for 1 ½ years at 10% p.a payable half-yearly is
    a) Rs.2,222   b) Rs.2,522
    c) Rs.2,500   d) none of these

33. The C.I on Rs.40000 at 10% p.a for 1 year when the interest is payable quarterly is
    a) Rs.4,000   b) Rs.4,100
    c) Rs.4,152.51   d) none of these

34. The C.I on Rs.4,000 for 6 months at 12% p.a payable quarterly is
    a) Rs. 243.60   b) Rs. 240.40
    c) Rs. 245.20   d) none of these

35. If P = 1,000, n = 4 years., R = 5% p.a. then C.I will be
    a) Rs.215.50   b) Rs.210
    c) Rs.220   d) none of these

36. If A = Rs.10,000, n = 18yrs, R = 4% p.a C.I, P will be
    a) Rs. 4,000   b) Rs.4,900
    c) Rs. 4,500   d) none of these

37. What is the compound interest (in Rs.) on a sum of Rs. 12,600 for $1\frac{1}{2}$ years at 20% per annum if the interest is compounded half yearly? (Nearest to a Rupee)
    a) 4271   b) 4171
    c) 4711   d) 4117

38. If compound interest on any sum at the rate of 5% for two years is Rs.512.50 then the sum would be: *(Scanner)*
    a) Rs.3,000   b) Rs.4,000
    c) Rs.5,000   d) Rs.6,000

39. A sum of money is put at 27% compound interest p.a. At which year aggregated amount just exceedes the double of the original sum? *(Scanner)*
    a) 6   b) 5
    c) 4   d) 3

40. On what sum will the compound interest at 5% p.a. for 2 years compounded annually be Rs. 3,280. *(Scanner)*
    a) Rs. 16,000   b) Rs. 32,000
    c) Rs. 48,000   d) Rs. 64,000

41. An amount P becomes Rs. 5,100.5 and Rs. 5,203 after second and fourth year respectively, at r% of interest per annum compounded annually. Thus, values of P and r are *(Scanner)*
    a) Rs. 5,000 and 1   b) Rs. 4,000 and 1
    c) Rs. 6,000 and 2   d) Rs. 5,500 and 3

42. A certain sum invested at 4% per annum compounded semi-annually amounts to Rs. 1,20,000 at the end of one year. Find the sum
    a) 1,10,120   b) 1,15,340
    c) 1,12,812   d) 1,13,113

43. Find the compound interest if an amount of Rs. 50,000 is deposited in a bank for one year at the rate of 8% per annum compounded semi annually
    a) Rs. 3080   b) Rs. 4080
    c) Rs. 5456   d) Rs. 7856

Set –B

1. The equivalent annual rate of interest due to compounding is –
   (a) Effective rate of interest
   (b) Simple interest
   (c) Compound interest
   (d) All of the above

2. The effective rate of interest does not depend upon *(Scanner)*

   a) Amount of Principal
   b) Amount of Interest
   c) Number of Conversion Periods
   d) None of these

3. Effective interest rate is not related to the amount of principal. This statement is
   a) True   b) False
   c) Partly true   d) Partly false

4. Lisa wants to know what the value of her RM 1,000 will be if she invests it for 3 years at a given rate. What is Lisa trying to find?
   a) Present value
   b) Future value
   c) Effective annual rate (EAR)
   d) Discount rate

5. The present value of a future amout will be higher with a higher interest rate.
   a) True   b) False

6. What is the definition of present value?
   a) The future value of a current sum of money
   b) The interest paid on a current sum of money
   c) The current value of a future sum of money
   d) The interest paid on a future sum of money

7. If u have offer from bank which give you choose between interest @ 12% p.a. compounded quaterly and 10% p.a. compounded annually for your deposits the you will select
   a) 10% p.a. compounded annually
   b) 12% p.a. compounded annually
   c) 12% p.a. compounded quaterly
   d) None of these

8. If we assume positive interest rate, present value is always _____ the future value
   a) Higher than   b) Lower than
   c) the same as

9. The effective annual rate of interest corresponding to nominal rate 6% p.a. payable half yearly is *(Scanner)*
   a) 6.06%   b) 6.07%
   c) 6.08%   d) 6.09%

10. Find the effective rate of interest at 10% p.a. when interest is payable quarterly. *(Scanner)*
    a) 10.38%   b) 5%
    c) 5.04%   d) 4%

11. Find the effective rate of interest on Rs.10,000 on which interest is payable half yearly at 5% p.a.
    (Scanner)
    a) 5.06%   b) 4%
    c) 0.4%   d) 3%

12. The effective rate of interest corresponding a nominal rate of 7% p.a convertible quarterly is
    a) 7%   b) 7.5%
    c) 5%   d) 7.18%

13. The effective rate of interest corresponding to a nominal rate 3% p.a payable half yearly is
    a) 3.2% p.a   b) 3.25% p.a
    c) 3.0225% p.a   d) none of these

14. Find the effective rate of interest if an amount of Rs.20,000 is deposited in a bank for one year at the rate of 8% per annum compounded semi annually.
    a) 8.16%   b) 8.18%
    c) 8.20%   d) None

15. Rs.5,000 is invested in a Term Deposit Scheme that fetches interest 6% per annum compounded quarterly. What is effective rate of interest?
    a) 6.101%   b) 6.115%
    c) 6.157%   d) 6.136%

16. Nominal rate of interest is 9.9% p.a. If interest is Compounded monthly, What will be the effective rate of interest   *(Scanner)*
    a) 10.36%   b) 9.36%
    c) 11.36%   d) 9.9%

17. The effective rate of return for 24% per annum convertible monthly is given as   *(Scanner)*
    a) 24%   b) 26.82%
    c) 27.42%   d) 24.24%

18. Which among the following is better investment? [(Given: 1.0075^{12} = 1.0938]
    (i) 9% per annum compounded monthly
    (ii) 9.25% per year simple interest
    a) (i)   b) (ii)
    c) Both (i) and (ii)   d) None of these

19. What annual rate of interest compounded annually doubles an investment in 7 years? Given that $2^{\frac{1}{7}}$ = 1.104090
    a) 10.51   b) 10.48
    c) 10.41   d) None

20. In how many years will a sum of money double at 8% p.a. compound interest?
    a) 9 years   b) 10 years
    c) 8 years   d) 12.5 years

21. The time in which a sum of money will be double at 5% p.a C.I is
    a) 10 years   b) 12 years
    c) 14.2 years   d) none of these

22. In how many years will a sum of money double at 5% p.a. compound interest?
    a) 15 years 3 months
    b) 14 years 2 months
    c) 14 years 3 months
    d) 15 years 2 months

23. The time by which a sum of money would treble it self at 8% p.a C.I is
    a) 14.28 years   b) 14 years
    c) 12 years   d) none of these

24. In how many years a sum of money trebles at 5% p.a. compound interest payable on half-yearly basis?
    a) 18 years 7 months
    b) 18 years 6 months
    c) 18 years 8 months
    d) 22 years 3 months

25. You are offered an investment opportunity with the "guarantee" that your investment will double in 5 years.

Assuming annual compounding, what annual rate of return would this investment provide?

a) 0%
b) 100%
c) 14.87%
d) 18.74%

26. The population of a town increases every year by 2% of the population at the beginning of that year. The number of years by which the total increase of population be 40% is

a) 7 years
b) 10 years
c) 17 years (app)
d) none of these

27. The annual birth and death rates per 1,000 are 39.4 and 19.4 respectively. The number of years in which the population will be doubled assuming there is no immigration or emigration

a) 35 years.
b) 30 years.
c) 25 years
d) none of these

28. The useful life of a machine is estimated to be 10 years and cost Rs.10,000. Rate of depreciation is 10% p.a. The scrap value at the end of its life is

a) Rs.3,486.
b) Rs.4,383
c) Rs.3,400
d) none of these

29. The value of scooter is Rs.10,000 find its value after 7 years if rate of depreciation is 10% p.a. *(Scanner)*

a) Rs.4,782.96
b) Rs.4,278.69
c) Rs.42,079
d) Rs.42,000

30. Scrap value of a machine valued at Rs.10,00,000, after 10 years within depreciation at 10% p.a.: *(Scanner)*

a) Rs.3,48,678.44
b) Rs.3,84,679.45
c) Rs.4,00,000
d) Rs.3,00,000

31. The value of furniture depreciates by 10% a year, it the present value of the furniture in an office is Rs.21,870, calculate the value of furniture 3 years ago *(Scanner)*

a) Rs.30,000
b) Rs.35,000
c) Rs.40,000
d) Rs.50,000

32. A machine is depreciated at the rate of 20% on reducing balance. The original cost of the machine was Rs.1,00,000 and its ultimate scrap value was Rs.30,000. The effective life of the machine is

a) 4.5 years (appx.)
b) 5.4 years (appx.)
c) 5 years (appx.)
d) none of these

33. A machine worth Rs.4,90,740 is depreciated at 15% on its opening value each year. When its value would reduce to Rs.2,00,000?

a) 4 years 6 months (approximately)
b) 4 years 2 months (approximately)
c) 5 years 1 months (approximately)
d) 5 years 7 months (approximately)

34. Anshul's father wishes to have Rs.75,000 in a bank account when his first college expenses begin. How much amount his father should deposit now at 6.5%compounded annually if Anshul is to start college in 8 years hence from now ?　　　　　　　　　　*(Scanner)*

a) Rs.45,360
b) Rs.46,360
c) Rs.55,360
d) Rs.48,360

35. The cost of Machinery is Rs.1,25,000/-If its useful life is estimated to be 20 years and the rate of depreciation of its cost is 10% p.a., then the scrap value of the Machinery is
　　　　　　　　　　　　　　　(Scanner)

a) Rs.15,187
b) Rs.15,487
c) Rs.15,387
c) Rs.15,287

36. The cost of machinery is Rs. 2,00,000 /- if its useful life is estimated to be 7 years and the rate of depreciation of its cost is 8% p.a., then the scrap value of the machinery is

a) 1,11,569
b) 1,20,169
c) 1,19,169
d) 3,42,765

37. At what % rate of compound interest (C.I) will a sum of money become 16 times in four years, if interest is being calculated compounding annually:　　　　　　　*(Scanner)*

a) r = 100%
b) r = 10%
c) r = 200%
d) r = 20%

38. A sum of money invested of compound interest doubles itself in four years. It becomes

32 times of itself at the same rate of compound interest in   *(Scanner)*
a) 12 years   b) 16 years
c) 20 years   d) 24 years

39. How long will Rs.12,000 take to amount to Rs.14,000 at 5% p.a. converted quarterly?
[Given : $(1.0125)^{12.4} = 1.1666$]   *(Scanner)*
a) 3 years   b) 3.1 years
c) 13.5 years   d) 12.4 years.

40. The ratio of principal and the compound interest value for three years (compounded annually)is 216 : 127. The rate of interest is
                                            (Scanner)
a) 0.1567   b) 0.1777
c) 0.1666   d) 0.1588

41. Rs. 1000 is lent at a nominal rate of 4.5% per annum compounded quarterly. What would be the gain in rupees when compounded annually.   *(Scanner)*
a) 0.56   b) 0.45
c) 0.76   d) 0.85

Set - C

1. The compound interest on half-yearly rests on Rs.10,000 the rate for the first and second years being 6% and for the third year 9% p.a. is Rs.____
a) 2,200   b) 2,287
c) 2,285   d) None

2. A sum was invested for 3 years as per C.I. and the rate of interest for first year is 9%, 2nd year is 6% and 3rd year is 3% p.a. respectively. Find the sum if the amount in three years is Rs.550?   *(Scanner)*
a) Rs. 250   b) Rs.300
c) Rs. 462.16   d) Rs.350

3. What will be the population after 3 years when present population is Rs.25,000 and population increases at the rate of 3% in I year, at 4% in II year and at 5% in III year?   *(Scanner)*
a) Rs.28,119   b) Rs.29,118
c) Rs.27,000   d) Rs.30,000

4. A person deposited Rs.5,000 in a bank. The deposit was left to accumulate at 6% compounded quarterly for the first five years and at 8% compounded semi-annually for the next eight years. The compound amount at the end of 13 years is: *(Scanner)*
a) Rs.12621.50   b) Rs.12613.10
c) Rs.13613.10   d) None

5. A sum of Rs. x amounts to Rs. 27,900 in 3 years and to Rs. 41,850 in 6 years at certain rate percent per annum, when the interest is compounded yearly. The value of x is
a) 16,080   b) 18,600
c) 18,060   d) 16,800

6. Johnson left Rs.1,00,000 with the direction that it should be divided in such a way that his minor sons Tom, Dick and Harry aged 9, 12 and 15 years should each receive equally after attaining the age 25 years. The rate of interest being 3.5%, how much should each son receive after getting 25 years old?
a) 50,000   b) 51,994
c) 52,000   d) None

Part - III
Simple Interest + Compound Interest
Set – A

1. Interest compounded on the principal for the entire period of borrowing is called-
a) Simple interest   b) Compound interest
c) Balance   d) All of the above

2. The principal goes on changing every year in-
a) Simple interest   b) Compound interest
c) Effective interest   d) All of the above

3. A bank offers two loan options both have same interest rate but in one alternative interest is charged on simple interest basis and in another interest is charged on compound interest basis. Which alternative is better for the borrower
    a) Simple interest
    b) Compound interest
    c) Cannot say like this without actually
    d) evaluating the two options in depth

4. The difference between compound and simple interest on a certain sum of money for 2 years at 4% p.a. is Rs.1. The sum (in Rs.) is: *(Scanner)*
    a) 625   b) 630
    c) 640   d) 635

5. The difference between the S.I and the C.I on Rs.2,400 for 2 years at 5% p.a is
    a) Rs.5   b) Rs.10
    c) Rs.16   d) Rs.6

6. If the difference between simple interest and compound interest is Rs.11 at the rate of 10% for two years, then find the sum. *(Scanner)*
    a) Rs.1,200   b) Rs.1,100
    c) Rs.1,000   d) None of these

7. The difference between the Compound interest and Simple interest at 10% per annum for 4 years on Rs.10,000 is Rs._____ *(Scanner)*
    a) 650   b) 640
    c) 641   d) 600

8. On what sum difference between compound interest and simple interest for two years at 7% p.a. interest is Rs. 29.4 *(Scanner)*
    a) Rs.5,000   b) Rs.5,500
    c) Rs.6,000   d) Rs.6,500

9. The difference between compound and simple interest at 5% per annum for 4 years on Rs. 20,000 is Rs._____
    a) 250   b) 277
    c) 300   d) 310

10. The simple interest for a certain sum for 2 years at 10% per annum is Rs.90. The corresponding compound interest is (In Rs.): *(Scanner)*
    a) 99   b) 95.60

c) 94.50   d) 108

11. If the simple interest on a sum of money at 12% p.a. for two years is Rs. 3,600. The compound interest on the same sum for two years at the same rate is:
    a) 3816   b) 3600
    c) 3720   d) 4000

12. A compound interest on a sum for 2 years is Rs.30 more than the simple interest at the rate of 5% per annum then the sum is *(Scanner)*
    a) Rs.11,000   b) Rs.13,000
    c) Rs.12,000   d) Rs.15,000

13. The compound interest for a certain sum @ 5% p.a. for first year is Rs.25. The S-I for the same money @ 5% p.a. for 2 years will be. *(Scanner)*
    a) Rs.40   b) Rs.50
    c) Rs.60   d) Rs.70

14. A sum of Rs. 7500 amounts to Rs. 9075 at 10% p.a., interest being compounded yearly in a certain time. The simple interest (in Rs.) on the same sum for the same time and the same rate is
    a) 1000   b) 1250
    c) 1800   d) 1500

15. If the simple interest on a sum of money at 12% p.a. for two years is Rs.3,600. The compound interest on the same sum for two years at the same rate is: *(Scanner)*
    a) Rs.3,816   b) Rs.3,806
    c) Rs.3,861   d) Rs.3,860

Set –B

1. If the difference between the compound interest compounded annually and simple interest on a certain amount at 10% per annum for two years is Rs.372, then the principal amount is *(Scanner)*
    a) Rs.37,200   b) Rs.37,000
    c) Rs.37,500   d) None of the above

2. If an amount is kept at simple interest, it earns an interest of Rs.600 in first two years but when kept at compound interest it earns an interest of Rs.660 for the same period, then the rate of interest and principal amount respectively are:

(Scanner)

a) 20%, Rs.1,200
b) 10%, Rs.1,200
c) 20%, Rs.1,500
d) 10%, Rs.1500

3. What is the difference (in Rs.) between the simple interest and the compound interest on a sum of Rs. 8,000 for $2\frac{2}{5}$ years at the rate of 10% p.a., when the interest is compounded yearly?

(Scanner)

a) 135.75
b) 129.50
c) 151.75
d) 147.20

4. The difference between the simple and compound interest on a certain sum for 3 year at 5% p.a. is Rs.228.75. The compound interest on the sum for 2 years at 5% p.a. is:

(Scanner)

a) Rs.3,175
b) Rs.3,075
c) Rs.3,275
d) Rs.2,975.

5. The compound interest on a certain sum for 2 years is ₹ 41 and the simple interest is ₹ 40. Find the interest % p.a.

a) 4 %
b) 5 %
c) 6 %
d) 8 %

6. The difference between C.I. and S.I on a certain sum of money invested for 3 years at 6% p.a. is Rs.110.16. The sum is

a) Rs.3,000
b) Rs.3,700
c) Rs.12,000
d) Rs.10,000

7. Mr. X invests 'P' amount at Simple Interest rate 10% and Mr. Y invests 'Q' amount at Compound Interest rate 5% compounded annually. At the end of two years both get the same amount of interest, then the relation between two amounts P and Q is given by:

(Scanner)

a) $P = \dfrac{41Q}{80}$
b) $P = \dfrac{41Q}{40}$
c) $P = \dfrac{41Q}{100}$
d) $P = \dfrac{41Q}{200}$

ANNUITY

Synopsis

Theory of Annuity :-

If an equal amount of money is paid or received again and again at fixed interval of time for a defined period, it is called as Annuity.

- Future value (F.V.) or Accumulated value (A) is to be used when the amount is to be received in future.

  Eg : recurring deposit, Sinking fund.

- Present Value (P) is to be used in case of Loans or advances i.e. when we borrow the amount.

	Annuity regular	Annuity Due
1. Payment is done	End of the period	Beginning of the period
2. Key words	End of year, End of period, at the end. (By default)	Starting from now, Beginning from now, Beginning from Today, As and when received.
3. A or F.V.	$\dfrac{c}{i}\,[(1+i)^n - 1]$	$\dfrac{c(1+i)}{i}\,[(1+i)^n - 1]$
4. P	$\dfrac{c}{i}\,[1-(1+i)^{-n}]$	$\dfrac{c\,(1+i)}{i}\,[1-(1+i)^{-n}]$

$i = \dfrac{r}{100}$, $n \to$ no. of periods. [Check compounding frequency to find i and n].

$C \to$ installment amount i.e. annuity amount.

A or F.V. $\to$ Accumulated value i.e. Future value.

$P \to$ Present value.

Please Note : -

1. If the amount is paid or receive only once it is "Compound Interest" and if the amount is paid or received again & again it is "Annuity".

   Provided everything remains same.

2. F.V. of regular annuity < F. V. of annuity due.

3. P of regular annuity < P of annuity due.

4. If a particular amount is written like (10) it means it is – 10 (minus 10).

Part - IV
Annuity (Regular)
Set – A

1. Annuities:
   a) are a stream of equal payments at unequal time intervals
   b) are a stream of equal payments at equal time intervals
   c) are a stream of equal payments that continue forever
   d) None of the above

2. A sequence of periodic payments over a number of years is-
   a) Compound interest   b) Annuity
   c) Effective Interest   d) Simple interest

3. Life Insurance Policy is an example of-
   a) Compound Interest   b) Annuity
   c) Effective Interest   d) Simple interest

4. In _____ first payment/receipt takes place at the end of first period
   a) Annuity   b) Annuity regular
   c) Annuity due   d) Annuity special

5. The tomorrow's value of today's money compounded at a particular rate of interest is called
   a) Present value of annuity
   b) Future value of annuity
   c) Forecast value of annuity
   d) None of these

6. The today's value of tomorrow's money discounted at a particular interest rate is called
   a) Present value of money
   b) Future value of annuity
   c) Forecast value of annuity
   d) None of these

7. A fund created by company to meet predetermined debts or certain liabilities out of their profit at the end of every accounting year is called

   a) Necessary fund   b) Sinking fund
   c) Immediate fund   d) None of these

8. Future value of an ordinary annuity: *(Scanner)*

   a) $A(n,i) = A\left[\dfrac{(1+i)^n - 1}{i}\right]$

   b) $A(n,i) = A\left[\dfrac{(1+i)^n + 1}{i}\right]$

   c) $A(n,i) = A\left[\dfrac{1-(1+i)^n}{i}\right]$

   d) $A(n,i) = A\left[\dfrac{(1+i)^n - 1}{i(1+i)^n}\right]$

9. The future value of an annuity of Rs.1,500 made annually for five years at interest rate 10% compounded annually is   *(Scanner)*
   a) Rs.9,517.56   b) Rs.9,157.65
   c) Rs.9,715.56   d) Rs.9,175.65

10. Find the future value of an annuity of Rs.500 made annually for 7 years at interest rate of 14% compounded annually. Given that $(1.14)^7$ = 2.5023.
    a) Rs.5,360.35   b) Rs.5,350.30
    c) Rs.5,365.35   d) None

11. Rs.200 is invested at the end of each month in an account paying interest 6% per year compounded monthly. What is the future value of this annuity after 10th payment?
    a) Rs.2,040   b) Rs.2,035
    c) Rs.2,045   d) Rs.2,044

12. Suppose you deposit Rs. 900 per month into an account that pays 14.8% interest compound monthly. How much money will you get after 9 months?
    a) Rs. 8,511   b) Rs. 9,000
    c) Rs. 9,200   d) Rs. 1,000

13. Find the future value of annuity of Rs. 1,000 made annually for 7 years at interest rate of 14% compounded annually. Given that $(1.14)^7$ = 2.5023.
    a) 10,730.7   b) 5,365.36
    c) 8,756   d0 9,892.34

14. The future value of annuity of Rs. 2,000 for 5 years at 5% compounded annually is given (in nearest Rs.) as
    a) 21051   b) 21021
    c) 15624   d) 61254

15. You want to take a world tour. Which costs Rs. 10,00,000 the cost is expected to remain, unchanged in nominal terms. You are willing to save annually Rs. 80,000 to fulfill your desire. How long will you have to wait if your savings earn a return of 14 percent per annum?
    a) 7 years   b) 8 years
    c) 7.17 years   d) 7.71 years

16. The amount of an annuity certain of Rs.150 for 12 years at 3.5% p.a. C.I is
    a) Rs.2,190.28   b) Rs.1,290.28
    c) Rs.2,180.28   d) none of these

17. Given annuity of Rs.100 amounts to Rs.3137.12 at 4.5% p.a C.I. The number of years will be
    a) 25 years (appx.)   b) 20 years (appx.)
    c) 22 years   d) none of these

18. How much amount is required to be invested every year so as to accumulate Rs.300000 at the end of 10 years if interest is compounded annually at 10%?
    a) Rs.17,899.62   b) Rs.18,823.62
    c) Rs.18,829.61   d) None

19. How much amount is required to be invested every year so as to accumulate Rs.3,00,000 at the end of 10 years, if interest is compounded annually at 10%?   *(Scanner)*
    a) Rs.18,823.65   b) Rs.18,828.65
    c) Rs.18,832.65   d) Rs.18,882.65

20. How much amount is required to be invested every year as to accumulate Rs.7,96,870 at the end of 10 years, if interest compounded annually at 10% given that A(10, 0.1) = 15.9374?   *(Scanner)*
    a) Rs.40,000   b) Rs.4,50,000
    c) Rs.48,000   d) Rs.50,000

21. Let a person invest a fixed sum at the end of each month in an account paying interest 12% per year compounded monthly. If the future value of this annuity after the 12th payment is Rs.55,000 then the amount invested every month is?   *(Scanner)*
    a) Rs.4,837   b) Rs.4,637
    c) Rs.4,337   d) Rs.3,337

22. Mr. X wants to accumulate Rs. 50,00,000 at the end of 10 years. Then how much amount is required to be invested every year. If interest is compounded annually at 10%? (Given that P (10,0.10) = 15.9374298)/
    a) Rs. 3,13,726.87   b) Rs. 4, 13,726.87
    c) Rs. 3,53.726.87   d) Rs. 4,53,726.87

23. Dr. Nileshbhai's daughter Priya is 2 years old. He wants to get Rs. 10,00,000 when his daughter is 22 years old. He opens recurring account with post office at 10% rate of compound interest. What amount should be deposit at the end of every month? [(Given : $1.0083)^{240}$ = 6.194]
    a) 1604.42   b) 1064.42
    c) 1460.42   d) None of these

24. Parents want to save $100,000 for their child's education. They plan to make fifteen equal year end payments and expect to earn an 8% annual interest rate. How much will they have to invest annually to accumulate the $100,000 ?
    a) $2,542   b) $3,683
    c) $6,139   d) $7,285

25. If the amount of an annuity after 25 years at 5% p.a. C.I is Rs.50,000 the annuity will be
    a) Rs. 1,405.62   b) Rs. 1,047.62
    c) Rs. 1,043.62   d) none of these

26. A sinking fund is created for redeeming debentures worth Rs.5 lakhs at the end of 25 years. How much provision needs to be made out of profits each year provided sinking fund investments can earn interest at 4% p.a.?
    a) 12,006   b) 12,040

c) 12,039　　　　　　　　d) 12,035

27. A sinking fund is created for redeeming debentures worth Rs.5 lacs at the end of 25 years. How much provision needs to be made out of profits each year provided sinking fund investments can earn interest at 4% p.a.?

(Scanner)

a) Rs.12,006　　　　b) Rs.12,040
c) Rs.12,039　　　　d) Rs.12,035

28. A = Rs.1,200 n = 12 years I = 0.08, V = ?

Using the formula $V = \dfrac{A}{i}\left[1 - \dfrac{1}{(1+i)^n}\right]$ value of v will be

a) Rs.3,039　　　　　　b) Rs. 3,990
c) Rs.9930　　　　　　　d) none of these

29. The present value of an annuity of Rs.3000 for 15 years at 4.5% p.a. CI is
a) Rs.23,809.41　　b) Rs.32,218.63
c) Rs.32,908.41　　d) none of these

30. The present value of annuity of Rs.5,000 per annum for 12 years at 4% p.a C.I. annually is
a) Rs.46,000　　　　b) Rs.46,850
c) Rs.15,000　　　　d) none of these

31. The present value of an annuity of Rs.80 a years for 20 years at 5% p.a is
a) Rs.997 (appx.)　　　b) Rs.900
c) Rs.1,000　　　　　　d) none of these

33. Rs.5,000 is paid every year for ten years to pay off a loan. What is the loan amount if interest rate be 14% per annum compounded annually?
a) Rs. 26,080　　　　b) Rs. 27,080
c) Rs. 25,080　　　　d) None

34. Rs. 2,500 is paid every year for 10 years to pay off a loan. What is the loan amount if interest rate by 14% per annum compounded annually?
a) 13,040.27　　　　　b) 15,847.90
c) 14,674.21　　　　　d) 16,345.11

34. If you borrowed $120,000 to buy a house and financed it at 10% annual interest for thirty years, what is your annual mortgage payment assuming that you make equal year end payment?
a) $4,000　　　　　　b) $3,500
c) $5,336　　　　　　d) $12,729

35. Rakesh borrows Rs. 4 lakhs Housing Loan at 4% repayable in 8 annual installments commencing at the end of the first year. How much annual payment is necessary.
a) 59411　　　　　　　b) 58411
c) 57411　　　　　　　d) 56411

Set –B

1. Paul borrows Rs.20,000 on condition to repay it with compound Interest at 5% p.a. in annual instalment of Rs.2,000 each. Find the number of years in which the debt would be paid off.

(Scanner)

a) 10 years　　　　　　b) 12 years
c) 14 years　　　　　　d) 15 years

2. S borrows Rs.5,00,000 to buy a house. If he pays equal instalments for 20 years and 10% interest on outstanding balance what will be the equal annual instalment?
a) Rs.58,729.84　　　b) Rs.55,729.84
c) Rs.56,729.84　　　d) Rs.57,729.84

3. A loan of Rs.10,000 is to be paid back in 30 equal installments. The amount of each installment to cover the principal and at 4% p.a. CI is
a) Rs.587.3　　　　b) Rs.597.3
c) Rs.578.3　　　　d) none of these

4. A company borrows Rs.10,000 on condition to repay it with compound interest at 5% p.a by annual installments of Rs.1000 each. The number of years by which the debt will be clear is
a) 14.2 years　　　　b) 10 years
c) 12 years　　　　　d) none of these

5. Vipul purchases a car for Rs.5,50,000. He gets a loan of Rs.5,00,000 at 15% p.a. from a Bank and balance Rs.50,000 he pays at the time of purchase. He has to pay the whole amount of loan in 12 equal monthly instalments with interest starting from the end of the first month. The money he has to pay at the end of every month is: [Given$(1.0125)^{12} = 1.16075452$]

    (Scanner)

    a) Rs.45,130.43   b) Rs.45,230.43
    c) Rs.45.330.43   d) None of these

6. Alibaba borrows Rs.6 lakhs Housing Loan at 6% repayable in 20 annual installments commencing at the end of the first year. How much annual payment is necessary.
    a) 52,420   b) 52,410
    c) 52,310   d) 52,320

7. A person bought a house paying Rs.20,000 cash down and Rs.4,000 at the end of each year for 25 yrs. At 5% p.a. C.I. The cash down price is
    a) Rs. 75,872   b) Rs.76,000
    c) Rs. 76,376   d) none of these

8. A loan of Rs. 1,02,000 is to be paid back in 2 installments. If the rate interest is 4% p.a. compounded annually, then the total interest charged is   *(Scanner)*
    a) 3,80   b) 4,160
    c) 6,160   d) 54,080

Set –C

1. A person invests Rs.500 at the end of each year with a bank which pays interest at 10% p. a C.I. annually. The amount standing to is credit one year after he has made his yearly investment for the 12th time is.
    a) Rs.11,761   b) Rs.10,692
    c) Rs.12,261   d) none of these

2. Y bought a TV costing Rs.13,000 by making a down payment of Rs.3000 and agreeing to make equal annual payment for four years. How much would be each payment if the

interest on unpaid amount be 14% compounded annually?
a) Rs.3,432.05   b) Rs.3,433.05
c) Rs.3,440.05   d) None

3. A man purchased a house valued at Rs.3,00,000. He paid Rs.2,00,000 at the time of purchase and agreed to pay the balance with interest at 12% per annum compounded half yearly in 20 equal half yearly installments. If the first installment is paid after six months from the date of purchase then the amount of each installment is
    a) Rs. 8,719   b) Rs. 8,769
    c) Rs. 8,893   d) none of these

4. The cost of machine today is Rs. 10,00,000 its life is 5 years. If the new machine after 5 years will cost 20% more then find what amout must be set aside from yearly profit to accumulate the fund @ 4% p.a. if the old machine will realize scrap value of Rs. 1,00,000
    a) 2,20,340   b) 2,21,553
    c) 1,84,627   d) 2,03,090

5. Appu retires at 60 years receiving a pension of 14,400 a year paid in half-yearly installments for rest of his life after reckoning his life expectation to be 13 years and that interest at 4% p.a. is payable half-yearly. What single sum is equivalent to his pension?
    a) 1,45,000   b) 1,44,900
    c) 1,44,800   d) 1,44,700

Part - V
Annuity (Due)
Set – A

1. A five year annuity due has periodic cash flow of Rs. 100 each year, If the interest rate is 8% the future value of this annuity is given by
    a) (Rs. 100) x (future value at rate 8% for 5 years) x (0.08)
    b) (Rs. 100) x (future value at rate 8% for 5 years) x (1-.08)
    c) (Rs. 100) x (future value at rate 8% for 5 years) x (1+.08)

d) (Rs. 100) x (future value at rate 8% for 5 years) x (1/0.08)

2. Mr. X Invests Rs.10,000 every year starting from today for next 10 years suppose interest rate is 8% per annum compounded annually. Calculate future value of the annuity: *(Scanner)*
   a) Rs.1,56,454.88   b) Rs.1,44,865.625
   c) Rs.1,56,554.88   d) None of these

3. Suppose your mom decides to gift you Rs.10,000 every year starting from today for the next five years. You deposit this amount in a bank as and when you receive and get 10% per annum interest rate compounded annually. What is the present value of this annuity?
   a) Rs.41,698.70   b) Rs.42,698.70
   c) Rs.41,695.70   d) None

4. Suppose your parent decides to open a PPF (Public Provident Found) account in a bank towards your name with Rs.10,000 every year starting from today for next 15 years. When you receive and get 8.5% per annum interest rate compounded annually. What is the present value of this annuity?(Give answer Rs. without any fraction)
   (Given P (15,0.085) = 8.304236576)   *(Scanner)*
   a) 83,042   b) 1,66,084
   c) 90,101   d) 8,30,423

5. Raja aged 40 wishes his wife Rani to have Rs.40 lakhs at his death. If his expectation of life is another 30 years and he starts making equal annual investments commencing now at 3% compound interest p.a. how much should he invest annually?
   a) 84,448   b) 84,450
   c) 81,628   d) 84,077

6. A man purchased a house valued at Rs. 7,00,000. He paid Rs. 4,00,000 at the time of purchase and agreed to pay the balance with interest at 10% per annum compounded half yearly in 5 years. If the first instalmetn is paid today itself then the amount of each installment is

a) 35,924   b) 37.001
c) 34,877   d) 39,342

7. When comparing an annuity due with an ordinary annuity with the same payment and duration, the annuity due will always have a _____ present value and will always have a _____ future value.
   a) higher; higher   b) higher; lower
   c) lower, higher   d) lower, lower

Part - VI
Other
Set – A

1. Higher the rate of return, _____ is the future value
   a) Higher   b) Lower
   c) Same   d) None of these

2 Higher the rate of return, _____ will be present value, (hint: present value + interest = future value)
   a) Higher   b) Lower
   c) Same   d) None of these

3. To calculate how much money I have to save today (i.e. onece) to have 1,000,000 in 30 years, I will use the formula for the
   a) Present value of annuity
   b) future value of annuity
   c) present value of a lump sum
   d) future value of lump sum

4. To calculate how much money I have to save every month to have 1,000,000 in 30 years, I will use the formula for the
   a) Present value of annuity
   b) future value of annuity
   c) present value of a lump sum
   d) future value of lump sum

5. To calculate how much money I have will have in 30 years if I save 1,000,000 today, I use the formula for the
   a) Present value of annuity
   b) future value of annuity
   c) present value of a lump sum
   d) future value of lump sum

6. X has Rs. 50,000 which he wish to invest for 10 years. If you have been asked to find out amount to be received by X at the end of 10th yet, then you have been asked to find.
    a) future value of Rs. 50,000 to be invested at present
    b) Present value of Rs. 50,000 to be invested in future
    c) future value of Rs. 50,0000 to be invested in future
    d) present value of Rs. 50,000 to be invest at present

7. X has been appointed as manager of a bank and he will be getting monthly salary of Rs. 100,000. He can easily keep aside 50% of his salary or can use the same to repay a loan, if you have been asked to find the amount of loan which he can get at 12% p.a. of which monthly installment would be Rs. 50,000. In this case you are asked to find
    a) future value of amount to be borrowed at present
    b) present value of amount to be repaid in future
    c) present value of amount to be borrowed in future
    d) future value of amount to be borrowed in future

8. Rahul has sold his agriculture land for Rs. 10,00,000, he decided to keep this money in bank at 15% p.a. and this amount would be withdrawn by Rahul in monthly installments over next 10 years. You have been asked to find how much amount would Rahul get every month? In this example state the true staments
    1) Rs. 10,00,000 is the present value
    2) Rs. 10,00,000 is the future value
    3) monthly installment is future value
    4) monthly installment is present value
    a) only 1 & 2   b) only 1 & 3
    c) only 2 & 4   d) all are true

9. I have two alternatives to buy a car
    (1) I can pay Rs. 15 lacs immediately
    (2) I can pay Rs. 16 lacs after 1 year. In this case to make a decision I should Bring amount payable after one year in the second alternative

to its _____ and then compare it with the amount payable under first alternative
a) Present value   b) future value
c) actual value   d) annuity value

10. X is making 25 monthly recurring payments and he with to know following two alternative amounts
    (1) What will be the loan which he can get against those recurring payments which he would be making
    (2) What will be the amount which he would be getting after 25 years against those recurring payments. In the first case we should find _____ and in the second case we should fine _____
    a) Present value; present value
    b) Present value; Future value
    c) Future value; Present value
    d) Future value; Future value

11. If country's population grows at 3% p.a. and you have been given its current population and asked to find population 10 years back, then you have to solve this by assuming
    a) current population as present value and population 10 years back as future value
    b) current population and population 10 years back both would be treated as present value
    c) current population as future value and population 10 years back as present value

12. In which of the following situation we can not use formula of annuity.
    a) an amount is borrowed and the same has to be repaid in 15 installments
    b) an amount has been invested as single payment and the same is to be withdrawn in 15 installments
    c) a fixed sum is to be invested every year and the same would be withdrawn at the end of 15 years in one stroke
    d) an amount has been borrowed and the same has to be repaid in one stroke at the end of 15 years

13. A machinery has been bought for Rs. 500,000 and it has to be depreciated at 15% p/a/ under diminishing balance method, here we should use formula of _____ with interest rate as _____

a) Simple interest; 15% p.a.
b) compouned interest; 15% p.a.
c) simple interest; 15% p.a.
d) compound interest; 15% p.a.

14. A student is supposed to pay monthly fees of Rs. 5,000 over 24 months. A parent has requested to accept Rs. 100,000 as one time fees which the parent would be paying at the first day of class. If we have to compare two alternatives as to which alternative is profitable to the classes, we must.
a) compare present value of installment by taking market rate of interest with one time fees
b) compare future value of installments by taking market rate of interest with one time fees
c) compare 1,20,000 (i.e 5,000 × 24) with Rs. 1,00,000.
d) all the above statements are true

15. A student is supposed to pay monthly fees of Rs. 5,000 over 24 months. A parent has requested to accept Rs. 150,000 as one time fees which the parent would be paying after 24 months are over. If we have to compare two alternatives as to which alternative is profitable to the classes, we must.
a) compare present value of monthly installment with the one time fees
b) compare future value of monthly installments with the one time fees
c) compare 1,20,000 (i.e 5,000 × 24) with Rs. 1,00,000.
d) all the above statements are true

16. A student is supposed to pay monthly fees of Rs. 5,000 over 24 months. A parent has requested to accept Rs. 110,000 as one time fees which the parent would be paying after 6 months from the day classes beings. If we have to compare two alternatives as to which alternative is profitable to the classes, we must.
a) bring one time fees to its present value and tehn compare it with monthly fees
b) bring monthly fees to its present value and then compare it with one time fees
c) bring fees payable under both alternatives to their present value and then compare
d) all the above statements are true

17. Which of the following statements is true?
a) F. V. of ordinary annuity < F.V. of annuity due
b) F.V. of ordinary annuity > F. V. of annuity due.
c P.V. of ordinary annuity > F.V. of annuity due
d) None of the above

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4B- APPLICATION OF TIME VALUE OF MONEY

(A) Leasing

1. In a leasing question following two alternative are given
    (1) Buy the asset at a cost of Rs. 5,00,000
    (2) Acquire the asset on lease with annual lease payments of Rs. 60,000 payable over 15 years (present value Rs. 512,540
    Which alternative is better and to what extent?
    a) Leasing will save Rs. 12,540
    b) Buying the asset can save Rs. 12,540
    c) Both alternatives are good
    d) None of these

2. ABC Ltd. wants to lease out an asset costing Rs.3,60,000 for a five year period . It has fixed a rental of Rs.1,05,000 per annum payable annually starting from the end of first year. Suppose rate of interest is 14% per annum compounded annually. Calculate the present value of this leasing.
    a) 3,60,473.40   b) 3,58,473.40
    c) 3,55,473.40   d) None

3. ABC Ltd. wants to lease out an asset costing Rs.3,60,000 for a five year period . It has fixed a rental of Rs.1,05,000 per annum payable annually starting from the end of first year. Suppose rate of interest is 14% per annum compounded annually on which money can be invested by the company. Is this agreement favorable to the company?
    a) Leasing is preferable
    b) Selling is preferable
    c) Both are same
    d) None

4. A company is considering proposal of purchasing a machine either by making full payment of Rs.4000 or by leasing it for four years at an annual rate of Rs.1,250. Which course of action is preferable, if the company can borrow money at 14% compounded annually? *(Scanner)* [**Given :** $(1.14)^4 = 1.68896$]
    a) Leasing is preferable
    b) Should be purchased

c) No difference
d) None of these

5. A company may obtain a machine either by leasing it for 5 years (useful life) at an annual rent of Rs.2,000 or by purchasing the machine for Rs.8,100. If the company can borrow money at 18% per annum, which alternative is preferable? *(Scanner)*
    a) Leasing   b) Purchasing
    c) Can't say   d) None of these

6. A person wants to lease out a machine costing Rs.5,00,000 for a 10 year period. It has fixed a rental of Rs.51,272 per annum payable annually starting from the end of first year. Suppose rate of interest is 10% per annum compounded annually on which money can be invested. To whom this agreement is favorable? *(Scanner)*
    a) Favour of Lessee
    b) Favour of Lessor
    c) Not for both
    d) Can't be determined

(B) Investment Decision

1. A machine can be purchased for Rs.50,000. Machine will contribute Rs.12,000 per year for the next five years. Assume borrowing cost is 10% per annum. Determine whether machine should be purchased or not: *(Scanner)*
    a) Should be purchased
    b) Should not be purchased
    c) Can't say about purchase
    d) None of the above

2. A machine with useful life of 8 years costs Rs. 26,000 while another machine with useful life of four year costs Rs. 15,000. The first machine saves labour expenses of Rs. 4,200 annually and the second one saves labour expenses of Rs. 5,000 annually. Determine the preferred course

of action. Assume cost of borrowing as 7% compounded per annum.
a) Machine 1 must be purchased
b) Machine 2 must be purchased
c) Machine 1 & 2 both must be purchased
d) Both machines should not be purchased

3. A machine with useful life of seven years costs Rs.10,000 while another machine with useful life of five years costs Rs.8,000. The first machine saves labour expenses of Rs.1,900 annually and the second one saves labour expenses of Rs.2,200 annually. Determine the preferred course of action. Assume cost of borrowing as 10% compounded per annum.
a) Machine 1 to be purchased
b) Machine 2 to be purchase
c) Both machines should be purchased
d) Both machines should not be purchased.

(C) Net Present Value

1. In an investment decision following cash flows are expected
(1) Initial cost of project Rs. 1.5 Lacs
(2) Recurring cash inflows of Rs. 45,000 over 5 years (Present value Rs. 188,750)
Find NPV
a) 188,750   b) 38,750
c) Nil   d) - 38,750

2. Evaluate following investment proposal
Year (1) Cash inflow of Rs. 100,000 (Present value of Rs. 83,000)
Year (2) Cash inflow of Rs. 50,000 (Present value of Rs. 39,000)
Year (3) Cash inflow of Rs. 20,000 (Present value Rs. 11,000)
Find NPV if initial investment required in the project is 130,000
a) -3,000   b) 14,000
c) 3,000   d) 21,750

3. For NPV, leasing questions, investment decisions 'i' is _____
a) Market rate of interest
b) Actual interest rate
c) Expected rate of return
d) Any of these

4. Suppose you have the following cash flow :

Year 0 : (- 1.00), Year 1 : (+0.25), Year 2 : (+0.45), Year 3 : (+0.65)
If the discount rate is 10%, then NPV of the cash flow is:
a) -0.09   b) 0.09
c) 0.35   d) 1.09

5. If the cost of capital is 10% Find the net present value (NPV) of cash inflows given as (refer table)

Year	Profit
1	10,000
2	25,000
3	12,000

a) 38,767.84   b) 38,748.37
c) 38,462.53   d) 38,748.37

6. If the cost of capital be 12% per annum, then the net present value (in nearest Rs.) from the given cash flow is given as

Year	0	1	2	3
Operating profit (in thousands Rs.)	(100)	60	40	50

a)31048   b) 34185
c) 21048   d) 24187

7. Compute the net present value for a project with a net investment of Rs.1,00,000 and net cash flows year one is Rs.55,000; for year two is Rs.80,000 and for year three is Rs.15,000. Further, the company's cost of capital is 10%?
a) 27,350   b) - 27,350
c) - 27,385   d) 27,385

8. New proposal for retail store has an upfront investment of Rs.5,00,000 returns after 1, 2, 3, & 4 years are expected to be Rs.2,00,000, Rs.1,50,000, Rs.80,000 & Rs.1,20,000 resp. If the cost of capital is 8%. State whether the proposal should be accepted or not.
a) Reject the proposal
b) Accept the proposal
c) Can't say
d) insufficient data.

9. An asset which cost Rs. 150,000 and which has life of 10 years. This asset can saves labour cost by Rs. 30,000 per annual for whole of its life. Find NPV if discounting rate is 14%
a) 6,483   b) 6,210

c) 8,481   d) None

IRR (Internal Rate of Return)

→ IRR is the annual rate of growth that an investment is expected to generate
→ IRR is calculated using the same concept as NPV excpt it sets NPV equal to zero

1. Suppose you have the follwing cash flow
    Year 0 : (- 1.00), Year 1 : (+0.25), Year 2 : (+0.45), Year 3 : (+0.65)
    If the discount rate is 10%, what can you say about the IRR of the cash flow
    a) IRR < 10%   b) IRR = 8.8%
    c) IRR > 10%   d) IRR = 35%

(D) Bond Valuation

1. A company offering rate of interest lower than the market rate need to issue its debentures at ____ in order to get those debentures subscribed by public
    a) Premium   b) Discount
    c) at par   d) any of the above

2. a 11% bond of Rs. 1000 having 3 years life payable at par on maturity will generate cash inflows in the form of
    I) Annual interest Rs. 110
    II) Maturity value of Rs. 1,000
    a) Only I   b) Only II
    c) Both I & II   d) Either I or II

3. An irredeemable bond gives annual interest of Rs. 300, an investor expects 8% interest from the given bond, at what price should the bond be purchased by that investor?
    a) 24   b) 3,750
    c) 4,000   d) 24,000

4. An investor intends purchasing a three year Rs.1,000 par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?
    a) Rs. 907   b) Rs.912
    c) Rs.918   d) None

5. An investor intends purchasing a two year Rs.5,000 par value bond having nominal interest

rate of 8%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 15%?
a) Rs.4937   b) Rs.4650
c) Rs.4431   d) None

6. A Rs. 1,00,000 3 yrs at par bond is being sold today at Rs. 67,000. If nominal rate offered is 4% and expected rate of return is 20% what should you do.
    a) Purchase the bond
    b) Don't purchase
    c) Data Insufficient
    d) None

7. A Rs. 3,00,000 2 yrs at par bond is being issued today at Rs. 2,43,000 and nomianl interest rate offered is 6%. If the expected rate of return is 16%. Then which conclusion is proper.
    a) Bond shuld be purchased as returns are above expected rate
    b) Bond should be purchased as returns are above nominal rate.
    c) Bond should not be purchased as returns are below expected rates
    d) bond should not be purchased as returns are below nominal rate

(E) Perpetuity

Perpetuity :
(1) It is an annuity which goes on indefitely
(2) The stream as cash flows continues with no end

$P.V. = \dfrac{C}{i}$, C – annuity amount , $i = \dfrac{r}{100}$ (r – interest rate also called rate of discounting)

1. For a non redeemable bond we most use
    a) Annuity
    b) Perpetuity
    c) Compound interest
    d) simple interest

2. How much money needs to be set aside if Rs. 1,000 is to be received each year and the discounting rate is 4% p.a.
    a) 20,000   b) 10,000
    c) 22,000   d) 25,000

3. A 12% bond of Rs. 1,000 which is non redeemable, is worth ____ if expected rate of return is 10%
   a) 1,000   b) 1,200
   c) 1,490   d) 1,580

4. A perpeuity of Rs. 1,000 if discounted at 10% is worth ____ if expected rate of return is 10%
   a) 100   b) 1000
   c) 10,000   d) 100,000

5. Determine the present value of perpetuity Rs. 10 per month for infinite period at an effective rate of interest of 14% p.a.?
   a) Rs. 657   b) Rs. 757
   c) Rs. 857   d) Rs. 957

6. The principal of a school wishes to award a gold medal to a student securing the highest mark in statistics in 12th Std. examination each year. If this model costs him Rs. 6,000 every year and the rate of compound interest is 10% then the fixed amount that he has to deposit in order to get the fund every year is
   a) 60000   b) 600000
   c) 66000   d) None of these

7. Lokjagrati Trust wants to create a fund to help their employee in unexpected circumstances. If the estimated unexpected expenses per month is Rs. 5,000 and the rate of compound interest is 12% then the amount required to be deposited by the trust is
   a) 50000   b) 500000
   c) 5000000   d) None of these

8. If Rs.50,000 is to be received each Quarter indefinitely, How much money needs to besetaside if 8% p.a. interest can be earned.
   a) Rs.6,25,000   b) Rs.25,00,000
   c) Rs.22,00,000   d) None

9. Atul wishes to create a countinues stream as cash flows which give him Rs. 12,000 each month. Find the amount he needs to deposit now if the rate of discounting is 6% p.a.
   a) 2,00,000   b) 6,00,000
   c) 12,00,000   d) 24,00,000

10. Ramesh wants to retire and receive Rs.3,000 a month. He wants to pass this monthly payment to future generations after his death. He can earn an interest of 8% compounded annually. How much will he need to set aside to achieve his perpetuity goal?
    a) Rs. 4,49,000   b) Rs. 4,50,000
    c) Rs.4,44,000   d) None

11. If a person bought a housing by paying Rs. 45,00,000 down payment and Rs. 80,000 at the end of each year till the perpetuity, assuming the rate of interest as 16% p.a. then the present value of the house is
    a) 5,00,000   b) 50,00,000
    c) 48,00,000   d) 52,00,000

12. Your recently won a competition, and the organizer has the following menu of prizes for you to choose from. You can only choose one option. If the discount rate is 12%, which option would you choose?
    a) THB 100,000 today (t = 0)
    b) THB 180,000 in 5 years (t = 5)
    c) THB 11,400 forever starting from the end of this year (t = 1)
    d) THB 18,000 every year for 10 years starting at the end of this year (t = 1)

(F) Growing Perpetuity

Growing Perpetuity : Here also the stream of cash flows is to be received every year but it also graws at some fixed rate called as growing rate (g)

$P.V. = \dfrac{C}{i - g}$, (i = discounting rate, g = growing rate, c = annuity amount)

1. Assuming that the discount rate is 7% per annum, how much would you pay to receive Rs.50, growing at 5%, annually, forever?
   a) 2,400   b) 2,200
   c) 2,500   d) none of these

2. Assuming that the discount rate is 12% per annum, how much would you pay to receive Rs.500, per month growing at 6%, annually, forever?
   a) 8,333   b) 12,640
   c) 1,00,000   d) none of these

3. If the discount rate is 14% per annum, then how much a company has to pay to receive Rs. 280 growing at 9% annually forever. **(Scanner)**
   a) Rs. 5,600   b) Rs. 2,800
   c) Rs. 1,714   d) None

4. Find the growing rate if Rs. 2,00,000 gives Rs. 7,000 half yearly and the discounting rate is 8% p.a.
   a) 8% p.a.   b) 2% p.a.
   c) 1% p.a.   d) None

5. If the discounting rate is 8% p.a. and growing rate is 4% p.a. how much amount each month can be paid if a person deposits Rs. 6,00,000
   a) Rs. 48,000   b) Rs. 24,000
   c) Rs. 4,000   d) Rs. 2,000

6. When an income is to be received over finite period we use _____ and when an income is to be received over indefinite period we use _____ but when the income grows at a fixed rest then we use _____
   a) Annuity ; compound interest; perpetuity
   b) Simple interest; compound interest; annuity
   c) Compound interest;annuity;perpetuity
   d) Annuity, perpetuity;growing perpetuity

(G) CAGR

CAGR :
(1) It is compound interest
(2) It is compounded annual growth rate
(3) It is used to find growth on investments/shares/bonus/mutual funds etc.

$$CAGR = \left[\left(\frac{V_{tn}}{V_{t0}} \right)^{\frac{1}{t_n - t_0}} - 1 \right]$$

1. The concept of CAGR has similarity with _____ and it is always expressed as _____
   a) Interest rate; percentage
   b) Principal; absolute value
   c) Amount; number
   d) None of these

2. A bank FD gives quarterly compounded 11% interest whereas TATA mutual fund has CAGR of 12% in such circumstances we can
   I) Compare 11% with 12% directly

II) Find effective rate of return for bank FD and then compare it with 12%
   a) Only I   b) Only II
   c) Both I & II   d) Either I or II

3. Given below are the revenues of a company for four years. Calculate Compound annual Growth Rate.

Year	2013	2014	2015	2016
Revenues	100	120	160	210

   a) 28.06%   b) 28.74%
   c) 25.24%   d) 25.75%

4. Given below are the revenues of a company for five years. Calculate Compound annual Growth Rate.

Year	2010	2011	2012	2013	2014
Revenues	1000	1100	970	1260	1440

   Calculate Compound annual Growth Rate.
   a) 9.54%   b) 8.74%
   c) 10 %   d) 10.75%

5. Find CAGR for year 6 with respect to year 2

Year	1	2	3	4	5	6
Profit	98	100	115	125	130.4	157.35

   a) 10%   b) 11%
   c) 12%   d) 13%

6. Find the CAGR for the year 2011 with respect to the year 2006

Year	Price
2005	40
2006	43
2007	48
2008	51
2009	59
2010	73
2011	64
2012	68

   a) 7.26%   b) 7.89%
   c) 8.07%   d) 8.28%

7. Avg. share price as a company are as follows

Year	Price
1995	5
1996	12
1997	18
1998	23
1999	31
2000	63
2001	68
2002	72

Find CAGR for a person who purchases in year 1996 and sells in year 1999

a) 35.432%   b) 37.216%
c) 39.437%   d) 38.513%

8. Avg. share price as a company are as follows

Price	Year
5	1995
12	1996
18	1997
23	1998
31	1999
63	2000
68	2001
72	2000

Find CAGR for a person who purchases in year 1997 and sells in year 2002

a) 30%   b) 28%
c) 32%   d) 36%

9. Let the operating profit of a manufacturer for five years is given as :

Year	Operating profit (in lakh Rs)
1	90
2	100
3	106.4
4	107.14
5	120.24
6	157.35

Then the operating profit of Compount Annual Growth Rate (CAGR) for year 6 with respect to year 2 is given at

a) 9%   b) 12%

c) 11%   d) 13%

10. A share has price of Rs. 150 in 2015, if it's price is Rs. 140 in 2016, then the CAGR is
a) 6.67%   b) -6.67%
c) 3.33%   d) -3.33%

11. If the nominal rate of growth is 17% and inflation is 9% for the five years. Let P be the Gross Domestic Product (GDP) amount at the present year then the projected real GDP after 6 years is
a) 1.587 P   b) 1.921 P
c) 1.403 P   d) 2.51 P

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Chap 5 :- Permutations & Combinations

1. **Factorial :** n! stands for n x (n -1) x (n-2) x (n-3).....1

    0! = 1 (predefined)

    1! = 1

    2! = 2x1 =2,

    3! = 3 x 2x 1 = 6,

    4! = 4 x 3 x 2 x 1 = 24.

    n! = n (n-1)!,

    n! = n (n-1) (n-2)!

Part - I
Factorial
(Module + Scanner)
Set - A

1. $\lfloor 0$ is a symbol equal to

    a) 0

    b) 1

    c) Infinity

    d) None of these

2. Find n if $\lfloor n+1 = 30 \lfloor n-1$

    a) 5

    b) 4

    c) 7

    d) none of these

3. (n + 1) ! = 20 (n – 1) !, find n   *(Scanner)*

    a) 6

    b) 5

    c) 4

    d) 10

Set - B

1. Find x if 1/9 ! + 1/10! = x/11!

    a) 125

    b) 121

    c) 122

    d) none of these

2. The value of N in $\dfrac{1}{7!}+\dfrac{1}{8!}=\dfrac{N}{9!}$ is   *(Scanner)*

    a) 81   b) 78

    c) 89   d) 64

3. $\lfloor 2n$ can be written as

    a) 2^n {1.3.5....(2n-1)} $\lfloor n$

    b) $2^n \lfloor n$

    c) {1.3.5....(2n -1)}

    d) none of these

FUNDAMENTAL PRINCIPLES OF COUNTING

1. **Multiplication Rule :** If certain thing may be done in 'm' different ways and when it has been done, a second thing can be done in 'n' different ways then total number of ways of doing both things simultaneously = mx n. [**i.e. And means multiplication]**

2. **Addition Rule :** If there are two alternatives of doing a job, which are Mutually Exclusive (i.e one of the alternative excludes the other) the first alternative capable of being performed in m ways and second alternative capable of being performed in n ways, then the total number of ways in which the job can be done = 'm+n' ways. **[i.e. OR means addition].**

Permutation	Combination
1. Deals with **arrangement**.	1. Deals with **selection**.
2. Order is **important**	2. Order is **not important**.
3. Key words, arrangement order, forming a word, farming a number, rank, position, designation.	3. Key words selection forming a group, team, committee, panel.
4. Arrangement of r elements out of n elements is $^{n}P_r = \dfrac{n!}{(n-r)!} \quad (n \geq r)$	4. Selection of r elements out of n elements is $^{n}C_r = \dfrac{n!}{r!(n-r)!} \quad (n \geq r)$
5. When 1 particular element is always part of arrangement $= r.^{n-1}P_{r-1}$	5. When 1 particular element is always part of selection $=^{n-1}C_{r-1}$
6. When 1 particular element is never part of arrangement $= {}^{n-1}P_r$	6. When 1 particular element is never part of selection $=^{n-1}C_r$

1. Permutation by default refers to linear permutations

2. $^{n}P_n = \dfrac{n!}{(n-n)!} = \dfrac{n!}{0!} = n!$ (That is why 0! = 1)

3. $^{n}P_{n-1} = \dfrac{n1}{[n-(n-1)]!} = \dfrac{n!}{1!} = n!$

4. Total arrangement = one particular always part of the arrangement + one particular never part of the arrangement

   $^{n}P_r = r.^{n-1}P_{r-1} + {}^{n-1}P_r$

5. $\displaystyle\sum_{r=1}^{n} r.^{r}P_r = {}^{n+1}P_{n+1} - 1$

Part - II
And/ OR
Set - A

1. There are 6 routes for journey from station A to station B. In how many ways you may go from A to B and return if for returning you make a choice of any of the routes?
   a) 6   b) 12   c) 36   d) 30

2. As per question No. (1) if you decide to take the same route you may do it in_____ number of ways.
   a) 6   b) 12
   c) 36   d) 30

3. As per question No. (1) if you decide not to take the same route you may do it in _____ number of ways.
   a) 6   b) 12   c) 36   d) 30

4. There are 10 trains plying between Calcutta and Delhi. The number of ways in which a person can go from Calcutta to Delhi and return by a different train is
   a) 99   b) 90
   c) 80   d) none of these

5. A person can go from place 'A to B' by 11 different modes of transport but is allowed to return back to "A" by any mode other than the one earlier. The number of different ways the entire journey can be complete is-
   a) 110   b) 10^{10}
   c) 9^5 d) 10^9

6. There are 4 routes for going from Dumdum to Sealdah and 5 routes for going from Sealdah to Chandni. In how many different ways can you go from Dumdum to Chandni via Sealdah?
   a) 9   b) 1   c) 20   d) None

7. If there are 50 stations on a railway line how many different kinds of single first class tickets may be printed to enable a passenger to travel from one station to other?
   a) 2500   b) 2450
   c) 2400   d) None

8. A dealer provides you Maruti car & Van in 2 body patterns and 5 different colours. How many choices are open to you?
   a) 2   b) 7   c) 20   d) 10

Set - B

1. In how many ways can 9 letters be posted in 4 letter boxes?
   a) 4^9 b) 4^5
   c) $^9P_4$ d) $^9C_4$

2. 5 letters are written and there are five letter-boxes. The number of ways the letters can be dropped into the boxes, are in each
   a) 119   b) 120
   c) 121   d) none of these

Part - III
Linear Permutations
Set - A

1. ^nP_r can also written as
   a) $\dfrac{\lfloor n}{\lfloor n-r}$ b) $\dfrac{\lfloor n}{\lfloor r\lfloor n-r}$

   c) $\dfrac{\lfloor r}{\lfloor n-r}$ d) none of these

2. If $^6P_r = 360$, then the value of 'r' is: *(Scanner)*
   a) 5   b) 3
   c) 4   d) None of these

3. If $^5P_r = 60$, then the value of r is
   a) 3   b) 2
   c) 4   d) none of these

4. In $^nP_r = n (n - 1) (n - 2) \ldots\ldots(n-r+1)$, the number of factors is
   a) n   b) r-1
   c) n-r   d) r

5. If $^nP_4 = 12\ ^nP_2$ the value of n is
   a) 12   b) 6
   c) -1   d) both 6 -1

6. If $^nP_4 = 20\ (^nP_2)$ then the value of 'n' is___.
   (Scanner)
   a) - 2   b) 7
   c) - 2 and 7 both   d) None of these

7. $^nP_r \div {}^{n-1}P_{r-1}$ is
    a) n
    b) n!
    c) (n-1)!
    d) ^nC_n

8. If $^{n+3}P_6 \div {}^{n+2}P_4 = 14$ the value of n is
    a) 8
    b) 4
    c) 5
    d) 2

9. If $^nP_4 = 12 \ {}^nP_2$, the n is equal to
    a) -1
    b) 6
    c) 5
    d) none of these

10. If. $^nP_3 : {}^nP_2 = 3 : 1$, then n is equal to
    a) 7
    b) 4
    c) 5
    d) none of these

11. $^nP_3 : {}^nP_2 = 2 : 1$ *(Scanner)*
    a) 4
    b) 7/2
    c) 5
    d) 2/7

12. If $^{n_1+n_2}P_2 = 132, {}^{n_1-n_2}P_2 = 30$ then,
    a) $n_1 = 6, n_2 = 6$
    b) $n_1 = 10, n_2 = 2$
    c) $n_1 = 9, n_2 = 3$
    d) none of these

13. If $^nP_{13} : {}^{n+1}P_{12} = 3:4$, then the value of 'n' will be:
    a) 13
    b) 15   *(Scanner)*
    c) 18
    d) 31

14. Given : P (7, k) = 60 P (7, k – 3). Then :   *Scanner)*
    a) k = 9
    b) k = 8
    c) k = 5
    d) k = 0

15. $^{m+n}P_2 = 56, {}^{m-n}P_2 = 30$ then
    a) m = 6, n = 2
    b) m = 7, n = 1
    c) m = 4, n=4
    d) none of these

16. The value of $\sum_{r=1}^{10} r \cdot {}^r P_r$ is
    a) $^{11}P_{11}$
    b) $^{11}P_{11} - 1$
    c) $^{11}P_{11} + 1$
    d) none of these

17. Number of ways of painting a face of a cube by 6 colours is ____   *(Scanner)*
    a) 36   b) 6   c) 24   d) 1

18. 3 persons go into a railway carriage having 8 seats. In how many ways they may occupy the seats?
    a) $^8P_3$
    b) $^8C_3$
    c) $^8C_5$
    d) None

19. How many three letters words can be formed using the letters of the words square?
    a) 110
    b) 120
    c) 111
    d) None

20. How many three letters words can be formed using the letters of the words hexagon?
    a) 200
    b) 210
    c) 225
    d) None

21. A man has 3 sons and 6 schools within his reach. In how many ways, he can send them to school, if no two of his sons are to read in the same school?   *(Scanner)*
    a) $^6P_2$
    b) $^6P_3$
    c) 6^3
    d) 3^6

22. How many six digit telephone numbers can be formed by using 10 distinct digits (no digit is being repeated)?   *(Scanner)*
    a) 10^6
    b) 6^{10}
    c) $^{10}C_6$
    d) $^{10}P_6$

23. If 12 school teams are participating in a quiz contest, then the number of ways the first, second and third positions may be won is
    a) 1,230
    b) 1,320
    c) 3,210
    d) none of these

24. First, second and third prizes are to be awarded at an engineering fair in which 13 exhibits have been entered. In how many different ways can the prizes be awarded?
    a) 1,716
    b) 1,710
    c) 1,714
    d) None

25. The number of four letter words can be formed using the letters of the word DECTIONARY is
    a) 5040
    b) 720
    c) 90
    d) 10240

26. How many four digits number can be formed by using 1 2 ....7?
   a) $^7P_4$ b) $^7P_3$
   c) $^7C_4$ d) None

27. When Jhon arrives in New York, he has eight shops to see, but he has time only to visit six of them. In how many different ways can he arrange his schedule in New York?
   a) 20160   b) 20150
   c) 20110   d) None

28. In how many ways can a family consist of three children here different birthdays in a leap year *(Scanner)*
   a) $^{365}C_3$
   b) $^{366^o}C_3 - 3$
   c) $366 \times 365 \times 364$
   d) $^{366}C_3$

29. In how many different ways can a club with 10 members select a President, Secretary and Treasurer, if no member can hold two offices and each member is eligible for any office?
   a) 715   b) 710
   c) 720   d) None

30. In how many different ways can five persons stand in a line for a group photograph?
   a) 122   b) 120
   c) 115   d) None

31. How many different words can be formed with the letters of the word "LIBERTY" *(Scanner)*
   a) 4050   b) 5040
   c) 5400   d) 4500

32. How many different words can be formed beginning with 't' of the word "triangle"?
   a) 8!   b) 7!
   c) 6!   d) 2! × 6!

33. How many arrangements can be made with the letter of the word "mathematics"?
   a) $11! \div (2!)^3$
   b) $11! \div (2!)^2$
   c) 11!
   d) None

34. The number of permutation of the word "Allahabad" is
   a) 9! ÷ (4! × 2!)   b) 9! ÷ 4!
   c) 9!   d) None

35. The number of words which can be formed by letters of the word 'ALLAHABAD' is:
   (Scanner)
   a) 7560   b) 3780
   c) 30240   d) 15120

36. In how many ways can the letters of the word "arrange" be arranged?
   a) 1200   b) 1250
   c) 1260   d) 1300

37. The number of arrangements that can be made with the word "assassination" is
   a) $13! \div [3! \times 4! \times (2!)^2]$
   b) $13! \div [3! \times 4! \times 2!]$
   c) 13!
   d) None

38. How many different permutations are possible from the letters of the word CALCULUS?
   a) 4050   b) 5040
   c) 3050   d) 5050

39. The letters of the words CALCUTTA and AMERICA are arranged in all possible ways. The ratio of the number of there arrangements is
   a) 1:2   b) 2:1
   c) 2:2   d) none of these

40. There are three blue balls, four red balls and five green balls. In how many ways can they be arranged in a row?   *(Scanner)*
   a) 26,720
   b) 27,720
   c) 27,820
   d) 26,620

41. In how many ways can 17 billiard balls be arranged, if 7 of them are black, 6 red and 4 white?
   a) 4084080   b) 4080085
   c) 4585084   d) None

Set - B

1. The number of ways in which 8 sweats of different sizes can be distributed among 8 persons of different ages so that the largest sweat always goes to be younger assuming that each one of then gets a sweat is
   a) $\lfloor 8$
   b) 5040
   c) 5039
   d) none of these

2. A garden having 6 tall trees in a row. In how many ways 5 children stand, one in a gap between the trees in order to pose for a photograph? *(Scanner)*
   a) 24
   b) 120
   c) 720
   d) 30

3. There are 5 speakers A, B, C, D and E. The number of ways in which A will speak always before B is
   a) 24
   b) $\lfloor 4 \times \lfloor 2$
   c) $\lfloor 5$
   d) none of these

4. How many words can be formed beginning with 'n' with the letters of the word "Sunday"?
   a) 6!
   b) 5!
   c) 4!
   d) None

5. How many words can be formed beginning with 'n' and ending in a' with the letters of the word "Sunday"?
   a) 6!
   b) 5!
   c) 4!
   d) None

6. How many different arrangements can be made beginning with 'a' and ending with 'n' with the letters of the word "oriental"?
   a) 6!
   b) 8!
   c) 4!
   d) None

7. The number of arrangements in which the letters of the word 'MONDAY' be arranged so that the words thus formed begin with M and do not end with N is
   a) 720
   b) 120
   c) 96
   d) none of these

8. The number of words that can be formed using the letter of "PETROL" such that the words do not have "" in the first postion is
   a) 720
   b) 120
   c) 600
   d) 54

9. The total number of 9 digit numbers of different digits is
   a) $10\lfloor 9$
   b) $8\lfloor 9$
   c) $9\lfloor 9$
   d) none of these

10. A code word is to consist of two English alphabets followed by two distinct numbers between 1 and 9. How many such code words are there? *(Scanner)*
    a) 6,15,800
    b) 46,800
    c) 7,19,500
    d) 4,10,800

11. The total number of sitting arrangements of 7 persons in a row if one person occupies the middle seat is _____.
    a) 5!
    b) 6!
    c) 2! × 5!
    d) None

12. The total number of sitting arrangements of 7 persons in a row if two persons occupy the end seats is _____.
    a) 5!
    b) 6!
    c) 2! × 5!
    d) None

13. The total number of sitting arrangements of 7 persons in a row if 3 persons sit together in any order is _____.
    a) 5!
    b) 6!
    c) 2! × 5!
    d) None

14. The total number of sitting arrangements of 7 persons in a row if 3 persons sit together in a particular order is _____.
    a) 5!
    b) 6!
    c) 2! × 5!
    d) None

15. The number of arrangements of the letters in the word 'FAILURE', so that vowels are always coming together is
    a) 576
    b) 575
    c) 570
    d) none of these

16. The number of ways the letters of the word 'TRIANGLE' to be arranged so that the word 'angle' will be always present is
a) 20
b) 60
c) 24
d) 32

17. There are 6 books on Economics, 3 on Mathematics and 2 on Accountancy. In how many ways can these be placed on a shelf if the books on the same subject are to be together?
a) 51,840
b) 50,840
c) 55,830
d) None

18. There are 6 students of whom 2 are Indians, 2 Americans, and the remaining 2 are Russians. They have to stand in a row for a photograph so that the two Indians are together, the two Americans are together and so also the two Russians. Find the number of ways in which they can do so.
a) 44
b) 48
c) 58
d) None

19. The number of ways in which 6 men can be arranged in a row so that the particular 3 men sit together, is
a) $^4P_4$
b) $^4P_4 \times {}^3P_3$
c) $(\lfloor 3)^2$
d) none of these

20. In how many ways 5 Sanskrit 3 English and 3 Hindi books be arranged keeping the books of the same language together?
a) $5! \times 3! \times 3! \times 3!$
b) $5! \times 3! \times 3!$
c) $^5P_3$
d) None

21. There are 5 books on English, 4 Books on Tamil and 3 books on Hindi. In how many ways can these books be placed on a shelf it the books on the same subjects are to be together?   *(Scanner)*
a) 1,36,800
b) 1,83,600
c) 1,03,680
d) 1,63,800

22. In how many ways of the word "mathematics" be arranged so that the vowels occur together?

a) $11! \div (2!)^3$
b) $(8! \times 4!) \div (2!)^3$
c) $12! \div (2!)^3$
d) None

23. In how many ways the word "arrange" be arranged such that the 2 'r' s come together?
a) 400
b) 440
c) 360
d) None

24. In how many ways the word "arrange" be arranged such that the 2 'r's and 2 'a' s come together?
a) 120
b) 130
c) 140
d) None

25. In how many ways the letters of the word "failure" can be arranged with the condition that the four vowels are always together?
a) $(4!)^2$
b) $4!$
c) $7!$
d) None

26. The number of ways of arranging 6 boys and 4 girls in a row so that all 4 girls are together is:
                    (Scanner)
a) $6!. 4!$
b) $2(7!. 4!)$
c) $7!. 4!$
d) $2. (6!. 4!)$

27. How many permutations can be formed from the letters of the word "DRAUGHT", if both vowels may not be separated?   *(Scanner)*
a) 720
b) 1,440
c) 140
d) 1,000

28. In how many ways can the word "strange" be arranged so that the vowels are never separated?
a) $6! \times 2!$
b) $7!$
c) $7! \div 2!$
d) None

29. In how many ways can the word "Strange" be arranged so that the vowels never come together?
a) $7! - 6! \times 2!$
b) $7! - 6!$
c) $^7P_6$
d) None

30. In how many ways the word "arrange" be arranged such that the 2 'r' s do not come together?
a) 1000
b) 900

c) 800   d) None

31. n articles are arranged in such a way that 2 particular articles never come together. The number of such arrangements is
a) (n-2) $\lfloor n-1 $
b) (n-1) $\lfloor n-2 $
c) $\lfloor n $
d) none of these

32. 10 examination papers are arranged in such a way that 2 particular articles never come together. The number of such arrangements is
a) $9\lfloor 8 $ b) $\lfloor 10 $
c) $8\lfloor 9 $ d) none of these

33. 7 books are to be arranged in such a way so that two particular books are always at first and last place. Final the number of arrangements.
(Scanner)
a) 60   b) 120
c) 240   d) 480

34. Find the no. of arrangements such that no 2 boys are together from 5 boys & 7 girls.
a) 7! × $^8p_5$
b) 5! × $^8p_5$
c) 5! × 7!
d) None

35. Find the arrangements such that no 2 girls are together from 5 boys & 7 girls.
a) 7! × $^6p_3$
b) 5! × $^6p_7$
c) 5! × $^7p_6$
d) not possible

36. Three girls and five boys are to be seated in a row so that no two girls sit together. Total no. of ways of this arrangement are: *(Scanner)*
a) 14,400   b) 120
c) $^5P_3$ d) 3! × 5!

37. In how many ways 21 red balls and 19 blue balls can be arranged in a row so that no two blue balls are together?
a) 1540   b) 1520
c) 1560   d) None

38. Six boys and five girls are to be seated for a photograph in a row such that no two girls sit together and no two boys sit together. Find the number of ways in which this can be done.
a) 85400
b) 86400
c) 88400
d) None

39. The number of ways the letters of the word "signal" can be arranged such that the vowels occupy only odd positions is ____.
a) 1440   b) 240
c) 480   d) 144

40. In how many ways can the word "strange" be arranged so that the vowels occupy only the odd places?
a) $^5P_5$ b) $^5P_5 × {}^4P_4$
c) $^5P_5 × {}^4P_2$ d) None

41. The number of ways in which that letters of the word 'MOBILE' be arranged so that consonants always occupy the odd places is
a) 36   b) 63
c) 30   d) none of these

42. If the letters word 'DAUGHTER' are to be arranged so that vowels occupy the odd places, then number of different words are
a) 2, 880   b) 676
c) 625   d) 576

43. The number of different ways the letter of the word. "DETAIL" can be arranged in such a sway that the vowels can occupy only the odd position is :
a) 32   b) 36
c) 48   d) 60

44. In how many ways the vowels of the word "Allahabad" will occupy the even places?
a) 120   b) 60
c) 30   d) None

45. 5 Men and 4 Women to sit in a row in such a manner that the woman always occupy the even places. The number of such arrangement will be: *(Scanner)*
a) 126   b) 1056

c) 2080   d)   2880

46. In how many ways can the letters of the word FAILURE be arranged so that the consonants may occupy only odd positions?
        (Scanner)
     a) 576   b)   476
     c) 376   d)   276

47. How many words can be formed with the letters of the word 'ORIENTAL' so that A and E always occupy odd places: *(Scanner)*
     a) 540
     b) 8640
     c) 8460
     d) 8450

48. The number of words that can be formed out of the letters of the word "ARTICLE" so that vowels occupy even place is: *(Scanner)*
     a) 36   b)   144
     c) 574   d)   754

49. How many different words can be formed with the letters of the word "triangle"?
     a) 8!   b)   7!
     c) 6!   d)   2! × 6!

50. How many different words can be formed beginning with 'e' of the letters of the word "triangle"?
     a) 8!   b)   7!
     c) 6!   d)   2! × 6!

51. In question No. (47) how many of them will begin with 't' and end with 'e'?
     a) 8!   b)   7!
     c) 6!   d)   2! × 6!

52. In question No. (47) how many of them have 't' and 'e' in the end places?
     a) 8!   b)   7!
     c) 6!   d)   2! × 6!

53. In question No. (47) how many of them have consonants never together?
     a) 8! – 4! × 5!
     b) $^6P_3$ × 5!
     c) 2! × 5! × 3!
     d) $^4P_3$ × 5!

54. In question No. (47) how many of them have arrangements no 2 vowels are together?
     a) 8! – 4! × 5!
     b) $^6P_3$ × 5!
     c) 2! × 5! ×3!
     d) $^4P_3$ × 5!

55. In question No. (47) how many of them have arrangements that consonants and vowels are always together?
     a) 8! – 4! × 5!   b) $^6P_3$ × 5!
     c) 2! × 5! ×3!   d) $^4P_3$ × 5!

56. In question No. (47) how many of them have arrangements that vowels occupy odd places?
     a) 8! – 4! × 5!
     b) $^6P_3$ × 5!
     c) 2! × 5! × 3!
     d) $^4P_3$ × 5!

57. In question No. (47) how many of them have arrangements that the relative positions of the vowels and consonants remain unchanged?
     a) 8! – 4! × 5!   b) $^6P_3$ × 5!
     c) 2! × 5! × 3!   d)   5! × 3!

58. The number of words from the letters of the word BHARAT, in which B and H will never come together, is   *(Scanner)*
     a) 360   b)   240
     c) 120   d)   None of the above

59. The letters of the word "VIOLENT" are arranged so that the vowels occupy even place only. The number of permutations is __.   *(Scanner)*
     a) 144   b)   120
     c) 24   d)   72

60. The number of ways the letters of the word 'COMPUTER' can be rearranged is
     a) 40,320   b) 40,319
     c) 40,318   d) none of these

61. The number of words that can be made by rearranging the letters of the word APURNA so that vowels and consonants appear alternate is
     a) 18   b)   35
     c) 36   d)   none of these

62. In a group of boys the number of arrangement of 4 boys is 12 times the number of arrangements of 2 boys. The number of boys in the group is
    a) 10   b) 8
    c) 6   d) none of these

63. If six times the number of permutations of 'n' items taken 3 at a time is equal to seven times the number of permutation of (n-1) items taken 3 at a time, then the value of 'n' will be:
    (Scanner)
    a) 7   b) 9
    c) 13   d) 21

64. The number of permutations of 10 different things taken 4 at a time in which one particular thing never occurs is
    a) 3,020
    b) 3,025
    c) 3,024
    d) none of these

65. The number of arrangements of 10 different things taken 4 at a time in which one particular thing always occurs is
    a) 2015   b) 2016
    c) 2014   d) none of these

66. Find the number of arrangements of 5 things taken out of 12 things, in which one particular thing must always be included.   *(Scanner)*
    a) 39,000   b) 37,600
    c) 39,600   d) 36,000

67. $^{(n-1)}P_r + r.^{(n-1)}P_{(r-1)}$ is equal to
    a) ^nC_r b) $\lfloor n / (\lfloor r \lfloor n - r)$
    c) ^nP_r d) none of these

CIRCULAR PERMUTATIONS

Synopsis

Arrangement of 'n' elements at 'n' places can be done in (n-1)! Ways.

Use $\frac{(n-1)!}{2}$ in following scenarios.

1. Same 2 neighbors cannot interchange among themselves (or interchange of neighbors is considered to be same).

2. Clockwise and anticlockwise relation is considered to be same. This is observed while.
    a) Forming a garland (from flowers).
    b) Forming a necklace (from beads).

Part - IV
Circular Permutations
Set - A

1. The number of ways in which 7 girls form a ring is
    a) 700
    b) 710
    c) 720
    d) none of these

2. In how many ways can 8 boys form a ring?
    a) 7! ÷ 2
    b) 7!
    c) 8!
    d) 8! ÷ 2

3. In how many ways can 4 persons sit at a round table for a group discussions?
    a) 4   b) 6   c) 5   d) None

4. In how many ways 6 men can sit at a round table so that all shall not have the same neighbours in any two occasions?
    a) 5! ÷ 2
    b) 5!
    c) $(7!)^2$
    d) 7!

5. If 50 different jewels can be set to form a necklace then the number of ways is
    a) $\frac{1}{2}\lfloor 50$
    b) $\frac{1}{2}\lfloor 49$
    c) $\lfloor 49$
    d) none of these

6. The number of ways in which 8 different beads be strung on a necklace is
    a) 2500
    b) 2520
    c) 2250
    d) none of these

Set - B

1. The number of ways in which 7 boys sit in a round table so that two particular boys may sit together is
    a) 240
    b) 200
    c) 120
    d) none of these

2. The chief ministers of 17 states meet to discuss the hike in oil price at a round table. In how many ways they seat themselves if the Kerala and Bengal chief ministers choose to sit together?
    a) 15! × 2!
    b) 17! × 2!
    c) 16! × 2!
    d) None

3. 5 persons are sitting in a round table in such way that Tallest Person is always on the right-side of the shortest person; the number of such arrangements is
    a) 6
    b) 12
    c) 24
    d) none of these

4. In how many ways can 6 boys and 6 girls be seated around a table so that no 2 boys are adjacent?
    a) 4! × 5!
    b) 5! × 6!
    c) $^6P_6$
    d) 5 × $^6P_6$

5. In how many ways can 4 Americans and 4 English men be seated at a round table so that no 2 Americans may be together?
   a) $4! \times 3!$
   b) $^4P_4$
   c) $3 \times {}^4P_4$
   d) $^4C_4$

6. In how many ways can a party of 4 men and 4 woman be seated at a circular table, so that no two woman are adjacent?   *(Scanner)*
   a) 164
   b) 174
   c) 144
   d) 154

7. The number of ways 5 boys and 5 girls can be seated at a round table, so no two boys are adjacent is _____.
   a) 2550
   b) 2880
   c) 625
   d) 2476

Set - C

1. 3 ladies and 3 gents can be seated at a round table so that any two and only two of the ladies sit together. The number of ways is
   a) 70
   b) 27
   c) 72
   d) none of these

Q'S BASED ON NUMBERS

Steps :-
1.   Check the given digits (if any).
2.   Number to be formed is of how many digits
3.   Repetation of digits is allowed or not.
4.   Is '0' (zero) given in the digits.
5.   Think first regarding that place where there is restriction.
6.   If the repetation of digits is not allowed and there is more than 1 restriction then use "BABA BREAKING"

Part - V
Q's on numbers
Set - A

1.   4 digit numbers to be formed out of the figures 0, 1, 2, 3, 4 (no digit is repeated) then number of such numbers is
   a)   120   b)   20
   c)   96.   d)   none of these

2.   How many telephones connections may be allotted with 8 digits form the numbers 0 1 2 ......9?
   a) 10^8
   b)   10!
   c) $^{10}C_8$
   d) $^{10}P_8$

Set - B

1.   How many six digit numbers can be formed out of 4 5 .....9 no digits being repeated?
   a)   6! – 5!   b)   6!
   c)   6! + 5!   d)   None

2.   In terms of question No. (1) how many of them are not divisible by 5?
   a)   6! – 5!   b)   6!
   c)   6! + 5!   d)   None

3.   How many numbers can be formed with the help of 2, 3, 4, 5, 6, 1 which is not divisible by 5, given that it is a six digit no. and digits are not repeating?   *(Scanner)*
   a)   600   b)   400
   c)   1200   d)   1400

4.   How many six digits numbers can be formed with the digits 9, 5, 3, 1, 7, 0?
   a)   600   b)   720
   c)   120   d)   None

5.   In terms of question No. (3) how many numbers will have 0's in ten's place?
   a)   600   b)   720
   c)   120   d)   None

6.   How many numbers of seven digit number which can be formed from the digits 3,4, 5, 6, 7, 8, 9 no digits being repeated are not divisible by 5?
   a) 4320   b) 4690
   c) 3900   d) 3890

7.   In how many different ways 3 rings of a lock can not combine when each ring has digits 0 1 2.........9 leading to unsuccessful events?
   a)   999   b) 10^3
   c)   10!   d)   997

8.   How many numbers between 1000 and 10000 can be formed with 1, 2, ...9?
   a)   3024   b)   60
   c)   78   d)   None

9.   The number of numbers between 1,000 and 10,000, which can be formed by the digits 1, 2, 3, 4, 5, 6 without repetition is: *(Scanner)*
   a)   720   b)   180   c)   360   d)   540

10. The number of numbers lying between 100 and 1000 can be formed with the digits 1, 2, 3, 4, 5, 6, 7 is
   a)   210   b)   200
   c)   110   d)   none of these

11. How many numbers between 3000 and 4000 can be formed with 1, 2, ...6?
    a) 3024   b) 60
    c) 78   d) None

12. How many 4 digits numbers greater than 7000 can be formed out of the digits 3, 5, 7, 8, 9?
    a) 24   b) 48
    c) 72   d) 50

13. The four digit numbers that can be formed out of the seven digits 1, 2, 3, 5, 7, 8, 9 such that no digit is repeated in any number and are greater than 3000 are: *(Scanner)*
    a) 120   b) 480
    c) 600   d) 840

14. The number of 4 digit numbers greater than 5,000 can be formed out of the digits 3, 4, 5, 6 and 7 (No. digit is repeated). The number of such is
    a) 72   b) 27
    c) 70   d) none of these

15. How many numbers higher than a million can be formed with the digits 0445553?
    a) 420   b) 360
    c) 7!   d) None

16. How many numbers greater than a million can be formed with the digits 4, 5, 5, 0, 4, 5, 3 ?   *(Scanner)*
    a) 260
    b) 360
    c) 280
    d) 380

Set - C

1. How many numbers not exceeding 1000 can be made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 if repetition is not allowed.   *(Scanner)*
    a) 364   b) 585
    c) 728   d) 819

2. The number of numbers lying between 10 and 1000 can be formed with the digits 2, 3, 4, 0, 8, 9 is
    a) 124   b) 120

    c) 125   d) none of these

3. Find the total number of numbers greater than 2000 that can be formed with the digits 1, 2, 3, 4, 5 no digit being repeated in any number.
    a) 216   b) 210
    c) 220   d) None

4. How many four digits numbers can be formed by using 1 2 .....7 which are grater than 3400?
    a) 500   b) 550
    c) 560   d) None

5. How many numbers greater than 23000 can be formed with 1, 2, ...5?
    a) 3024   b) 60
    c) 78   d) None

6. The number of even numbers greater than 300 can be formed with the digits 1, 2, 3, 4, 5 without repletion is
    a) 110
    b) 112
    c) 111
    d) none of these

7. The total number of numbers less than 1000 and divisible by 5 formed with 0 1 2......9 such that each digit does not occur more than once in each number is
    a) 150   b) 152
    c) 154   d) None

COMBINATIONS

1) Denotions ^nC_r, C (n, r), nCr, $\binom{n}{r}$, $n \geq r$

2) $^nC_r = \dfrac{n!}{r!\,(n-r)!}$

3) $^nC_o = ^nC_n = 1$

4) $^nC_1 = ^nC_{n-1} = n$

5) $^nC_r = ^nC_{n-r}$

6) **If** $^nC_x = ^nC_y$ **then** $x = y$ **or** $x = n - y$.

7) **Pascal's Rule** $^nC_{r-1} + ^nC_r = ^{n+1}C_r$

8) Selection of atleast 1 element $\quad ^nC_1 + ^nC_2 + ^nC_3 + - - - - - + ^nC_n = 2^n - 1$

Part - VI
Combinations
Set - A

1. If C(n, r) : C(n, r + 1) = 1 : 2 and C (n, r + 1): C (n, r + 2) = 2:3, determine the value of n and r : *(Scanner)*
   a) (14, 4)   b) (12, 4)
   c) (14, 6)   d) None

2. If $^nC_6 / \, ^{n-3}C_3 = 91/4$ then the value of n is _____
   a) 15   b) 14
   c) 13   d) None

3. If $^{18}C_n = ^{18}C_{n+2}$ then the value of n is _____
   a) 0   b) -2
   c) 8   d) None

4. Find r if $^{18}C_r = ^{18}C_{r+2}$
   a) 6   b) 8
   c) 16   d) 4

5. If $^{18}C_r = ^{18}C_{r+2}$, the value of $^rC_5$ is
   a) 55   b) 50
   c) 56   d) none of these

6. If $^{15}C_{3r} = ^{15}C_{r+3}$, then 'r' is equal is *(Scanner)*
   a) 2   b) 3   c) 4   d) 5

7. If $^nC_{10} = ^nC_{14}$, then $^{25}C_n$ is
   a) 24   b) 25
   c) 1   d) none of these

8. If $^{28}C_{2r} : ^{24}C_{2r-4} = 225 : 11$, then the value of r is
   a) 7   b) 5

c) 6   d) none of these

9. The value of $^{12}C_4 + ^{12}C_3$ is
   a) 715   b) 710
   c) 716   d) none of these

10. $^{15}C_3 + ^{15}C_{13}$ is equal to : *(Scanner)*
    a) 16_{c_3} b) $30_{c_{16}}$
    c) $15_{c_{16}}$ d) $15_{c_{15}}$

11. If $^{500}C_{92} = ^{499}C_{92} + ^nC_{91}$ then n is
    a) 501   b) 500
    c) 502   d) 499

12. Find x if $^{12}C_5 + 2 \, ^{12}C_4 + ^{12}C_3 = ^{14}C_x$
    a) 5 or 9   b) 6 or 9
    c) 4 or 8   d) None

13. If $^{10}C_3 + 2. \, ^{10}C_4 + ^{10}C_5 = ^nC_5$ then value of n is: *(Scanner)*
    a) 10   b) 11
    c) 12   d) 13

14. If $^{13}C_6 + 2 \, ^{13}C_5 + ^{13}C_4 = ^{15}C_x$ then, x = ___. *(Scanner)*
    a) 6   b) 7   c) 8   d) 9

15. If $^{1000}C_{98} = ^{999}C_{97} + ^xC_{901}$, find x : *(Scanner)*
    a) 999   b) 998
    c) 997   d) 1000

16. $^nC_1 + ^nC_2 + ^nC_3 + ^nC_4 + \ldots\ldots+$ equals
    a) $2^n - 1$ b) 2^n
    c) $2^n + 1$ d) none of these

17. The value of $\sum\limits_{r=1}^{5} {}^5C_r$ is: *(Scanner)*

    a) 29   b) 31
    c) 35   d) 26

18. A building contractor needs three helpers out of ten men supply. In how many ways can these selections take place? *(Scanner)*

    a) 36   b) 15
    c) 150   d) 120

19. A committee is to be formed of 3 persons out of 12. Find the number of ways of forming such a committee.

    a) 225   b) 228
    c) 220   d) None

20. Six seats of articled clerks are vacant in a 'Chartered Accountant Firm' How many different batches of candidates can be chosen out of ten candidates? *(Scanner)*

    a) 216   b) 210
    c) 220   d) None

21. A Company wishes to simultaneously promote two of its 6 department heads to assistant managers. In how many ways these promotions can take place?

    a) 15   b) 30
    c) 20   d) 11

22. A fruit basket contains 7 apples, 6 bananas and 4 mangoes. How many selections of 3 fruits can be made so that all 3 are apples?

    a) 120 ways   b) 35 ways
    c) 168 ways   d) 70 ways

23. In how many ways can a consonant and a vowel be chosen out of the letters of the word "logarithm"?

    a) 18   b) 15
    c) 3   d) None

24. In how many ways can a consonant and a vowel be chosen out of the letters of the word "equation"?

    a) 18   b) 15
    c) 3   d) None

Set - B

1. The number of ways a person can contribute to a fund out of 1 ten-rupee note, 1 five-rupee note, 1 two-rupee and 1 one rupee note is

   a) 15   b) 25
   c) 10   d) none of these

2. A person has 8 friends. The number of ways in which he may invite one or more of them to a dinner is.

   a) 250   b) 255
   c) 200   d) none of these

3. The number of ways in which a person can chose one or more of the four electrical appliances: T.V, Refrigerator, Washing Machine and a cooler is

   a) 15   b) 25
   c) 24   d) none of these

4. In order to pass PE-II examination minimum marks have to be secured in each of 7 subjects. In how many ways can a pupil fail?

   a) 128   b) 64
   c) 127   d) 63

5. In how many ways can 4 people be selected at random from 6 boys and 4 girls if there are exactly 2 girls? *(Scanner)*

   a) 90   b) 360
   c) 92   d) 480

6. A person has ten friends of whom six are relatives. If he invites five guests such that three of them are his relatives, then the total number of ways in which he can invite them are: *(Scanner)*

   a) 30   b) 60
   c) 120   d) 75

7. A bag contains 4 red, 3 black and 2 white balls. In how many ways 3 balls can be drawn from this bag so that they include at least one black ball? *(Scanner)*

   a) 64   b) 46
   c) 85   d) None of the above

8. In how many ways a committee of 6 members can be formed from a group of 7 boys and 4 girls having at least 2 girls in the committee.

    (Scanner)

    a) 731   b) 137
    c) 371   d) 351

9. There are 6 men and 4 women in a group, then the number of ways in which a committee of 5 persons can be formed of them, if the committee is to include at least 2 women are:

    (Scanner)

    a) 180   b) 186
    c) 120   d) 105

10. Out of 7 boys and 4 girls a team of debate club of 5 is to be chosen. The number of teams such that each team includes at least one girl is _____.

    a) 429   b) 439
    c) 419   d) 441

11. Five bulbs of which three are defective are to be tried in two bulb points in a dark room. Number of trials the room shall be lighted is

    a) 6   b) 8
    c) 5   d) 7

12. Five bulbs of which three are defective are to be tried in two lights-points in a dark-room. In how many trials the room shall be lighted?

    (Scanner)

    a) 10   b) 7
    c) 3   d) None of these

13. There are 7 men and 3 ladies. Find the number of ways in which a committee of 6 can be formed of them if the committee is to include atleast two ladies?

    a) 150   b) 135
    c) 140   d) None

14. From 7 men and 4 women a committee of 5 is to be formed. In how many ways can this be done to include at least one woman?

    a) 441   b) 440
    c) 420   d) None

15. Out of 7 gents and 4 ladies a committee of 5 is to be formed. The number of committees such that each committee includes at least one lady is

    a) 400   b) 440
    c) 441   d) none of these

16. A committee of 7 members is to be chosen from 6 Chartered Accountants, 4 Economists and 5 Cost Accountants. In how many ways can this be done if in the committee, there must be at least one member from each group and at least 3 Chartered Accountants?

    a) 3,570   b) 3,550
    c) 3,560   d) None

17. You are selecting a cricket team of first 11 players out of 16 including 4 bowlers and 2 wicket-keepers. In how many ways you can do it so that the team contains exactly 3 bowlers and 1 wicket-keeper?

    a) 960   b) 840
    c) 420   d) 252

18. In question No. (16) would your answer be different if the team contains at least 3 bowlers and at least 1 wicket-keeper?

    a) 2472
    b) 960
    c) 840
    d) 420

19. A person has 12 friends of whom 8 are relatives. In how many ways can he invite 7 guests such that 5 of them are relatives?

    a) 330   b) 336
    c) 350   d) None

20. A candidate is required to answer 6 out of 12 questions which are divided into two groups containing 6 questions in each group. He is not permitted to attempt not more than four from any group. The number of choices are.

    a) 750   b) 850
    c) 800   d) none of these

21. An examination paper consists of 12 questions divided into two parts A and B. Part A contains 7 questions and part B contains 5 questions. A candidate is required to attempt 8 questions selecting at least 3 from each part. In how many maximum ways can the candidate select the questions? *(Scanner)*
    a) 35
    b) 175
    c) 210
    d) 420

22. In a paper from 2 groups of 5 questions each you have to answer any 6 questions attempting at least 2 questions from each group. This is possible in ____number of ways.
    a) 50
    b) 100
    c) 200
    d) None

23. A question paper divided into 2 groups consisting of 3 and 4 questions respectively carries the not "it is not required to answer all the questions. One question must be answered from each group". In how many ways you can select the questions?
    a) 10
    b) 11
    c) 12
    d) 13

24. Every two persons shakes hands with each other in a party and the total number of hand shakes is 66. The number of guests in the party is
    a) 11
    b) 12
    c) 13
    d) 14

25. Number of ways of shaking hands in a group of 10 persons shaking hands to each other are: *(Scanner)*
    a) 45   b) 54   c) 90   d) 10

26. If these are 40 guests in a party. If each guest takes a shake hand with all the remaining guests. Then the total number of hands shake is ____. *(Scanner)*
    a) 780
    b) 840
    c) 1,560
    d) 1,600

27. A Supreme Court Bench consists of 5 judges. In how many ways, the bench can give a majority division? *(Scanner)*
    a) 10
    b) 5

c) 15
d) 16

28. The Supreme Court has given a 6 to 3 decision upholding a lower court; the number of ways it can give a majority decision reversing the lower court is
    a) 256
    b) 276
    c) 245
    d) 226

29. In your college Union election you have to choose candidates. Out of 5 candidates 3 are to be elected and you are entitled to vote for any number of candidates but not exceeding the number to be elected. You can do it in ____ways.
    a) 25
    b) 5
    c) 10
    d) None

30. At an election there are 5 candidates and 3 members are to be elected. A voter is entitled to vote for any number of candidates not greater than the number to be elected. The number of ways a voter choose to vote is
    a) 20
    b) 22
    c) 25
    d) none of these

31. In your office 4 posts have fallen vacant. In how many ways a selection out of 31 candidates can be made if one candidate is always included?
    a) $^{30}C_3$
    b) $^{30}C_4$
    c) $^{31}C_3$
    d) $^{31}C_4$

32. In question No. (30) would your answer be different if one candidate is always excluded?
    a) $^{30}C_3$
    b) $^{30}C_4$
    c) $^{31}C_3$
    d) $^{31}C_4$

33. Out of 8 different balls taken three at a time without taking the same three together more that once for how many number of times you can select a particular ball?
    a) $^7C_2$
    b) $^8C_3$
    c) $^7P_2$
    d) $^8P_3$

34. In question No. (32) for how many number of times you can select any ball?
    a) $^7C_2$
    b) $^8C_3$
    c) $^7P_2$
    d) $^8P_3$

35. A committee is to be formed of 2 teachers and 3 students out of 10 teachers and 20 students. The numbers of ways in which this can be done is ___.
    a) $^{10}C_2 \times ^{20}C_3$
    b) $^9C_1 \times ^{20}C_3$
    c) $^{10}C_2 \times ^{19}C_3$
    d) None.

36. In question No. (34) if a particular teacher is included the number of ways in which this can be done is ____.
    a) $^{10}C_2 \times ^{20}C_3$
    b) $^9C_1 \times ^{20}C_3$
    c) $^{10}C_2 \times ^{19}C_3$
    d) None

37. In question No. (34) if a particular student is excluded the number of ways in which this can be done is ____.
    a) $^{10}C_2 \times ^{20}C_3$
    b) $^9C_1 \times ^{20}C_3$
    c) $^{10}C_2 \times ^{19}C_3$
    d) None

38. A party of 6 is to be formed from 10 men and 7 women so as to include 3 men and 3 women. In how many ways the party can be formed if two particular women refuse to join it?
    a) 4200   b) 600
    c) 3600   d) 1200

39. Out of 4 gents and 6 ladies, a committee is to be formed find the number of ways the committee can be formed such that it comprises of at least 2 gents and at least the number of ladies should be double of gents.
    (Scanner)
    a) 94   b)   132
    c) 136   d)   104

40. In forming a committee of 5 out of 5 males and 6 females how many choices you have to make so that there are 3 males and 2 females?
    a) 150   b)   200
    c) 1   d)   461

41. In question No. (39) how many choices you have to make if there are 2 males?

42. In question No. (39) how many choices you have to make if there is no female?
    a) 150   b)   200
    c) 1   d)   461

43. In question No (39) how many choices you have to make if there is at least one female?
    a) 150   b)   200
    c) 1   d)   461

44. In question No. (39) how many choices you have to make if there are not more than 3 males?
    a) 200   b)   401
    c) 461   d)   431

45. You have to make a choice of 4 balls out of one red one blue and ten white balls. The number of ways this can be done to always include the red ball is _____.
    a) $^{11}C_3$ b) $^{10}C_3$
    c) $^{10}C_4$ d)   None

46. In question No. (44) the number of ways in which this can be done to include the red ball but exclude the blue ball always is _____.
    a) $^{11}C_3$
    b) $^{10}C_3$
    c) $^{10}C_4$
    d) None

47. In question No. (44) the number of ways in which this can be done to exclude both the red and blues ball is ____.
    a) $^{11}C_3$
    b) $^{10}C_3$
    c) $^{10}C_4$
    d) None

48. Out of 6 members belonging to party 'A' and 4 to party 'B' in how many ways a committee of 5 can be selected so that members of party 'A' are in a majority?
    a) 180   b)   186
    c) 185   d)   184

49. How many combinations can be formed of 8 counters marked 1 2 ....8 taking 4 at a time there being at least one odd and even numbered counter in each combination?
    a) 68
    b) 66
    c) 64
    d) 62

50. A team of 12 men is to be formed out of n persons. Then the number of times 2 men 'A' and 'B' are together is _____.
    a) $^{n}C_{12}$
    b) $^{n-1}C_{11}$
    c) $^{n-2}C_{10}$
    d) None

51. In question No. (49) the number of times 3 men 'C' 'D' and 'E' are together is ____.
    a) $^{n}C_{12}$
    b) $^{n-1}C_{11}$
    c) $^{n-3}C_{9}$
    d) None

52. In question No. (49) it is found that 'A' and 'B' are three times as often together as 'C' 'D' and 'E' are. Then the value of n is ____.
    a) 32
    b) 23
    c) 9
    d) None

53. A boy has 3 library tickets and 8 books of his interest in the library of these 8, he does not want to borrow Mathematics part-II unless mathematics part-I is also borrowed? In how many ways can he choose the three books to be borrowed?   *(Scanner)*
    a) 41
    b) 51
    c) 61
    d) 71

Set – C

1. If $^{n}C_{r-1} = 56$, $^{n}C_{r} = 28$ and $^{n}C_{r+1} = 8$, then r is equal to
    a) 8
    b) 6
    c) 5
    d) none of these

2. How many ways a team of 11 players can be made out of 15 players if one particular player is not to be selected in the team.   *(Scanner)*
    a) 364
    b) 728
    c) 1,001
    d) 1,234

3. A committee of 3 ladies and 4 gents is to be formed out of 8 ladies and 7 gents. Mrs. X refuses to serve in a committee in which Mr. Y is a member. The number of such committees is
    a) 1530
    b) 1500
    c) 1520
    d) 1540

4. An examination paper with 10 questions consists of 6 questions in Algebra and 4 questions in Geometry. At least one question from each section is to be attempted. In how many ways can this be done?
    a) 945
    b) 940
    c) 935
    d) None

5. Find the number of ways of selecting 4 letters from the word EXAMINATION.
    a) 130
    b) 136
    c) 133
    d) None

6. Find the number of ways in which a selection of 4 letters can be made from the word "Mathematics".
    a) 130
    b) 132
    c) 134
    d) 136

7. The number of combinations that can be made by taking 4 letters of the word "combination" is ___.
    a) 70
    b) 63
    c) 3
    d) 136

8. The number of ways in which 12 students can be equally divided into three groups is
    a) 5775
    b) 7575
    c) 7755
    d) none of these

9. The number of ways in which 15 mangoes can be equally divided among 3 students is
    a) $\lfloor 15 / \lfloor (5)^{4}$
    b) $\lfloor 15 / \lfloor (5)^{3}$
    c) $\lfloor 15 / \lfloor (5)^{2}$
    d) none of these

COMBINATIONS (GEOMETRICAL)

Basic concepts of Geometry
- 2 points lying on a plane are always collinear.
- 3 or more points are said to be collinear if they lie on same line.
- Chord is a line joining any 2 points on a circle.
- If 3 or more lines are intersecting at the same point then they are called as concurrent.

1. If there are 'n' non-collinear points in a plane then,
    a) no. of lines = $^nC_2$
    b) no. of $\Delta's$ = $^nC_3$
    c) no. of Quadrilaterals = $^nC_4$

2. If 'm' out of total 'n' points are collinear then,
    a) no. of lines = $^nC_2 - {}^mC_2 + 1$
    b) no. of $\Delta's$ = $^nC_3 - {}^mC_3$
    c) no. of Quadrilaterals = $^nC_4 - {}^mC_4$

3. For a 'n' sided polygon maximum no of diagonals is $^nC_2 - n$.

4. If a set of 'm' parallel lines intersects another set of 'n' parallel lines than no. of parallelograms =
    $^nC_2 \ X \ {}^mC_2$

5. Total points obtained when a set consists of n lines is such a way that no 2 are parallel and no 3 are intersecting = $^nC_2$.

6. Maximum distinct points obtained when n circles intersect = $^nP_2$.

Part - VII
Combinations (Geometrical)

1. The number of straight lines obtained by joining 16 points on a plane, no three of them being on the same line is
    a) 120
    b) 110
    c) 210
    d) none of these

2. Let S be the collection of eight points in the plane with no three points on the straight line. Find the number of triangles that have points of S as vertices.
    a) 56   b) 50
    c) 45   d) None

3. There are 12 points in a plane no 3 of which are collinear except that 6 points which are collinear. The number of different straight lines is ____.
    a) 50   b) 51
    c) 52   d) None

4. In question No. (3) the number of different triangles formed by joining the straight lines is ____.
    a) 220   b) 20
    c) 200   d) None

5. There are 12 points in a plane of which 5 are collinear. The number of triangles is
    a) 200   b) 211
    c) 210   d) none of these

6.   The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line, is: *(Scanner)*
     a) 185   b) 175
     c) 115   d) 105

7.   8 points are marked on the circumference of a circle. The number of chords obtained by joining these in pairs is
     a) 25   b) 27
     c) 28   d) none of these

8.   Six points are on a circle. The number of quadrilaterals that can be formed are: *(Scanner)*
     a) 30   b) 360
     c) 15   d) none of the above

9.   The number of diagonals in a decagon is
     a) 30   b) 35
     c) 45   d) none of these

10. A polygon has 44 diagonals then the number of its sides are: *(Scanner)*
     a) 8   b) 9
     c) 10   d) 11

11. The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is
     a) 6   b) 18
     c) 12   d) 9

12. The number of parallelograms, formed from a set of six parallel lines intersecting another set of four parallel lines is: *(Scanner)*
     a) 360   b) 90
     c) 180   d) 45

13. The maximum number of points of inter section of 10 circles will be: *(Scanner)*
     a) 2   b) 20
     c) 90   d) 180

Practice Questions - Permutations + Combinations
Set - A

If the elements to be arranged are to be taken from different places then we perform firstly selection and then arrangement.

1.   If $^nP_r = 336$ and $^nC_r = 56$, then n and r will be
     a) (3, 2)   b) (8, 3)
     c) (7, 4)   d) none of these

2.   If $^{10}P_r = 604800$ and $^{10}C_r = 120$; find the value of r,
     a) 5   b) 8
     c) 7   d) None

3.   If $^6P_r = 24\ ^6C_r$, then find r :   *(Scanner)*
     a) 4   b) 6
     c) 2   d) 1

4.   If $^nP_r = 720$ and $^nC_r = 120$, then value of 'r' is: *(Scanner)*
     a) 4   b) 5
     c) 6   d) 3

Set – B

1.   Out of 10 consonants and 4 vowels how many words can be formed each containing 6 consonant and 3 vowels?
     a) $^{10}C_6 \times {}^4C_3$ b) $^{10}C_6 \times {}^4C_3 \times 9!$
     c) $^{10}C_6 \times {}^4C_3 \times 10!$ d) None

2.   The number of words which can be formed with 2 different consonants and 1 vowel out of 7 different consonants and 3 different vowels the vowel to lie between 2 consonants is _____.
     a) $3 \times 7 \times 6$ b) $2 \times 3 \times 7 \times 6$
     c) $2 \times 3 \times 7$ d) None

Set - C

1.   Find the number of ways in which an arrangement of 4 letters can be made from the word "Mathematics".
     a) 1680   b) 756
     c) 18   d) 2454

2   A boat's crew consist of 8 men, 3 of whom can row only on one side and 2 only on the other. The number of ways in which the crew can be arranged is _____.
     a) $^3C_1 \times (4!)^2$ b) $^3C_1 \times 4!$

c) $^3C_1$ d)   None

3   In how many ways that the crew of an eight oared be arranged so that if 3 of crew can row only on a stoke side and 2 row on the other side is ____.   *(Scanner)*
a) 1728   b)   256
c) 164   d)   126

4.   Eight guests have to be seated 4 on each side of a long rectangular table. 2 particular guests desire to sit on one side of the table and 3 on the other side. The number of ways in which the sitting arrangements can be made is
a) 1732   b) 1728
c) 1730   d) 1278

Practice Question - Other
Set - A

1.   Compute the sum of 4 digit numbers which can be formed with the four digits 1, 3, 5, 7, if each digit is used only once in each arrangement.
a) 105556   b)   106656
c) 106050   d)   None

2.   The sum of all 4 digit number containing the digits 2, 4, 6, 8, without repetitions is
a) 1, 33, 330   b)   1, 22, 220
c) 2, 13, 330   d)   1, 33, 320

3.   In a cross word puzzle 20 words are to be guessed of which 8 words have each an alternative solution. The number of possible solution is ____.
a) $(2×8)^2$ b) $^{20}C_{16}$
c) $^{20}C_8$ d)   None

4.   If all the permutations of the letters of the word "chalk" are written in a dictionary the rank of this word will be____.
a) 30   b)   31
c) 32   d)   None

5.   In how many ways it is possible to write the word "zenith" in a dictionary?
a) $^6P_6$ b) $^6C_6$
c) $^6P_0$ d)   None

6.   In terms of question No. (5) what is the rank or order of the word "zenith" in the dictionary?
a) 613   b)   615
c) 616   d)   618

Set - B

1.   A computer has 5 terminals and each terminal is capable of four distinct positions including the positions of rest what is the total number of signals that can be made?
a) 20   b) 1020
c) 1023   d) None

2.   A question paper contains 6 questions, each having an alternative. The number of ways an examine can answer one or more questions is
a) 720
b) 728
c) 729
d) none of these

3.   The results of 8 matches (Win, Loss or Draw) are to be predicted. The number of different forecasts containing exactly 6 correct results is
a) 316
b) 214
c) 112
d) none of these

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6. SEQUENCE, SERIES & PROGRESSION

Synopsis :-

Sequence

An arrangement of numbers in a definite order according to some rule is called a sequence. 1, 3, 5, 7.....is an infinite series. 2+4+6+8 is a finite series.

Progression

If the terms of a sequence follow certain pattern then the sequence is called a progression.

There are three types of progression :-

1.   Arithmetic Progression.
2.   Geometric Progression.
3.   Harmonic Progression.

Arithmatic Progression

If the difference of any term and its previous term is constant then the given sequence is called an arithmetic progression.

1) n^{th} term of A.P

$t_n = a + (n -1)d$

Where a = first term., n = number of terms, d = common difference, $t_n = n^{th}$ term

2.   Sum of n term of A.P

$S_n = \frac{n}{2}$ [2a+(n-1)d]   or $S_n = \frac{n}{2}(a + l)$

Where a -first term, l = last term, d = common difference, S_n = sum of n terms

3)   Number of numbers in A.P.

1. Two numbers in A.P. (a -d), (a + d)
2. Three numbers in A.P.   (a-d), a, (a + d)
3. Four numbers in A.P (a-3d), (a – d), (a +d), (a + 3d)
4. Five numbers in A. P. a – 2d, a-d, a, a+d, a + 2d.

Part - I
A. P.
(Module + Scanner)
Set - A

1. The nth element of the sequence 1, 3, 5, 7, ...
    is
    a) n   b) 2n – 1
    c) 2n + 1   d) none of these

2. The 20th term of the progression 1, 4, 7,
    10.........is
    a) 58   b) 52
    c) 50   d) none of these

3. The last term of the series 5, 7, 9, ...to 21 terms
    is
    a) 44   b) 43
    c) 45   b) none of these

4. The last term of the A.P. 0.6, 1.2, 1.8, ... to 13
    terms is
    a) 8.7   b) 7.8
    c) 7.7   d) none of these

5. Find the ninth term of the series: **(Scanner)**
    $\sqrt{2}, 5\sqrt{2}, 9\sqrt{2}, ...$
    a) $25\sqrt{2}$ b) $31\sqrt{2}$
    c) $33\sqrt{2}$ d) $25\sqrt{2}$

6. Which term of the progression -1, -3, -5, ..is -
    39
    a) 21st b) 20th
    c) 19th d) none of these

7. Which term of the A. P $\frac{3}{\sqrt{7}}, \frac{4}{\sqrt{7}}, \frac{5}{\sqrt{7}}, ...$ is $\frac{17}{\sqrt{7}}$?
    a) 13   b) 14
    c) 15   d) 16

8. The value C such that a, -3, b, 5, c are in A.P. is:
                                           (Scanner)
    a) - 7   b) 1
    c) 13   d) 9

9. The 4 arithmetic means between -2 and 23 are
    a) 3, 13, 8, 18   b) 18, 3, 8, 13
    c) 3, 8, 13, 18   d) none of these

10. The two arithmetic means between -6 and 14
    is
    a) 2/3, 1/3   b) $2/3, 7\frac{1}{3}$
    c) $-2/3, -7\frac{1}{3}$ d) none of these

11. Insert two Arithmetic means between 68 and
    260   **(Scanner)**
    a) 132, 196
    b) 130, 194
    c) 70, 258
    d) None of the above.

12. Insert 4 A.M.'s between 3 and 18 :   **(Scanner)**
    a) 12, 15, 9, 6
    b) 6, 9, 12, 15
    c) 9, 6, 12, 15
    d) 15, 12, 9, 6

13. Divide 12.50 into five parts in A.P. such that the
    first part and the last part are in the ratio of 2:3
    a) 2, 2.25, 2.5, 2.75, 3
    b) -2, -2.25, -2.5, -2.75, -3
    c) 4, 4.5, 5, 5.5, 6
    d) -4, -4.5, -5, -5.5, -6

14. Divide 30 into five parts in A.P., such that the
    first and last parts are in the ratio 2:3: **(Scanner)**
    a) $\frac{24}{5}, \frac{27}{5}, 6, \frac{33}{5}, \frac{36}{5}$
    b) $6, \frac{36}{5}, \frac{33}{5}, \frac{24}{5}, \frac{27}{5}$
    c) $\frac{27}{5}, \frac{24}{4}, \frac{36}{5}, \frac{33}{5}, 6$
    d) $6, \frac{24}{5}, \frac{27}{5}, \frac{33}{5}, \frac{36}{5}$

15. The five numbers in A.P. with their sum 25 and
    the sum of their squares 135 are _____.
    a) 3, 4, 5, 6, 7   b) 3, 3.5, 4, 4.5, 5
    c) -3, -4, -5, -6, -7   d) -3, -3.5, -4, -4.5, -5

16. If the sum of five terms of AP is 75. Find the
    third term of the series   **(Scanner)**
    a) 35   b) 30
    c) 15   d) 20

17. If the 10th term of an A.P is twice the 4th term, and 23rd term is 'K' times the 8th term, then the value of 'k' is
    a) 2.5   b) 3
    c) 3.5   d) 4

18. The sum of three integers in AP is 15 and their product is 80. The integers are
    a) 2, 8, 5   b) 8, 2, 5
    c) 2, 5, 8   d) -8, -5, -2

19. Find three numbers in A.P. whose sum is 6 and the product is -24
    a) -2, 2, 6   b) -1, 1, 3
    c) 1, 3, 5   d) 1, 4, 7

20. Find three numbers in A.P. whose sum is 6 and the sum of whose square is 44.
    a) -2, 2, 6   b) -1, 1, 3
    c) 1, 3, 5   d) 1, 4, 7

21. Find three numbers in A.P. whose sum is 6 and the sum of their cubes is 216.
    a) -2, 2, 6   b) -1, 1, 3
    c) 1, 3, 5   d) 1, 4, 7

22. The three numbers in A.P. whose sum is 18 and product is 192 are ____.
    a) 4, 6, 8   b) -4, -6, -8
    c) 8, 6, 4   d) both (a) & (c)

23. The three numbers in A.P., whose sum is 27 and the sum of their squares is 341, are ____.
    a) 2, 9, 16
    b) 16, 9, 2
    c) both (a) and (b)
    d) -2, -9, -16

24. The four numbers in A.P., whose sum is 24 and their product is 945, are ____.
    a) 3, 5, 7, 9
    b) 2, 4, 6, 8
    c) 5, 9, 13, 17
    d) None

25. The four numbers in A.P., whose sum is 20 and the sum of their squares is 120, are ____.
    a) 3, 5, 7, 9   b) 2, 4, 6, 8

c) 5, 9, 13, 17   d) None

26. Divide 144 into three parts which are in AP and such that the largest is twice the smallest, the smallest of three numbers will be : *(Scanner)*
    a) 48   b) 36
    c) 13   d) 32

27. The four numbers in A.P. with the sum of second and third being 22 and the product of the first and fourth beinf 85 are ____.
    a) 3, 5, 7, 9
    b) 2, 4, 6, 8
    c) 5, 9, 13, 17
    d) None

28. If the n terms of two A.P.s are in the ratio $(3n+4) : (n + 4)$ the ratio of the fourth term is ____.
    a) 2   b) 3   c) 4   d) None

29. The number of numbers between 74 and 25,556 divisible by 5 is
    a) 5, 090   b) 5, 097
    c) 5, 095   d) none of these

30. The sum of the series 9, 5, 1, ...to 100 terms is
    a) -18,900   b) 18,900
    c) 19,900   d) none of these

31. The sum of series 7+14+21+.... to 17th term is:
    a) 1071   b) 971
    c) 1171   d) 1271

32. The sum of the series 3 ½ + 7 + 10½ + 14 + ... to 17 terms is
    a) 530   b) 535
    c) 535 ½   d) none of these

Set - B

1. Find the number which should be added to the sum of any number of terms of the A.P. 3, 5, 7, 9, 11 .... resulting in a perfect square.
    a) -1   b) 0
    c) 1   d) None

2. If unity is added to the sum of any number of terms of the A.P. 3, 5, 7, 9, ... The resulting sum is
    a) 'a' perfect cube
    b) 'a' perfect square
    c) 'a' number
    d) none of these

3. The sum of n terms of an AP is $3n^2 + 5n$. The series is
    a) 8, 14, 20, 26
    b) 8, 22, 42, 68
    c) 22, 68, 114, ...
    d) none of these

4. The sum of a certain number of terms of an AP series -8, -6, -4, ...is 52. The number of terms is
    a) 12   b) 13
    c) 11   d) none of these

5. The number of terms of the series 5+ 7 + 9 + ... must be taken so that the sum may be 480
    a) 20   b) 10
    c) 15   d) 25

6. If the sum 50 + 45 + 40 + 35 + _____ is zero, then the number of terms is: *(Scanner)*
    a) 22   b) 20
    c) 21   d) 25

7. The first and the last term of an AP are -4 and 146. The sum of the terms is 7171. The number of terms is
    a) 101   b) 100
    c) 99   d) none of these

8. The number of the terms of the series 10 + $9\frac{2}{3}+9\frac{1}{3}+9+......$ will amount to 155 is
    a) 30
    b) 31
    c) both (a) & (b)
    d) none of these

9. Find the sum of the series:
    2 + 7 + 12 + ... 297.   *(Scanner)*
    a) 8970   b) 8870
    c) 7630   d) 9875

10. The sum of a series in A.P. is 72 the first term is 17 and the common difference -2. The number of terms is _____.
    a) 6   b) 12
    c) 6 or 12   d) None

11. The first term of an A.P is 14 and the sums of the first five terms and the first ten terms are equal is magnitude but opposite in sign. The 3rd term of the AP is
    a) $6\frac{4}{11}$
    b) 6
    c) 4/11
    d) none of these

12. The pth term of an AP is (3p – 1)/6. The sum of the first n terms of the AP is
    a) n (3n + 1)
    b) n/12 (3n + 1)
    c) n/12 (3n -1)
    d) none of these

13. If the sum of n terms of an A.P. is $(3n^2 – n)$ and its common difference is 6, then its first term is:
                                                        (Scanner)
    a) 3   b) 2
    c) 4   d) 1

14. The nth term of the series whose sum to n terms is $5n^2 + 2n$ is
    a) 3n – 10
    b) 10n – 2
    c) 10n – 3
    d) none of these

15. The sum of n terms of an A.P. is $2n^2 + 3n$. Find the nth term.
    a) 4n + 1   b) 4n – 1
    c) 2n + 1   d) 2n – 1

16. If the sum of n terms of an A.P be $2n^2 + 5n$, then its 'nth' term is: *(Scanner)*
    a) 4n – 2   b) 3n – 4
    c) 4n + 3   d) 3n + 4

17. If the sum of first 'n' terms of an A.P. is $6n^2 + 6n$, then the fourth term of the series:
                                                        (Scanner)

a) 120   b) 72
c) 48   d) 24

18. If the sum of 'n' terms of an AP (Arithmetic Progression) is $2n^2$, the fifth term is _____.
a) 20   b) 50
c) 18   d) 25

19. In an A.P., if common difference is 2, Sum of n terms is 49, 7th term is 13 then n = ____
(Scanner)
a) 0   b) 5
c) 7   d) 13

20. If third term and seventh term of an A.P are eighteen and thirty respectively, then sum of first twenty terms will be: *(Scanner)*
a) 540   b) 610
c) 740   d) 810

21. The 4th term of an A.P. is three times the first and the 7th term exceeds twice the third term by 1. Find the first term 'a' and common difference 'd'.   *(Scanner)*
a) a = 3, d = 2
b) a = 4, d = 3
c) a = 5, d = 4
d) a = 6, d = 5

22. An Arithmetic progression has 13 terms whose sum is 143. The third term is 5 so the first term is: *(Scanner)*
a) 4   b) 7
c) 9   d) 2

23. If the sum of the 4th term and the 12th term of an A.P. is 8, what is the sum of the first 15 terms of the progression?   *(Scanner)*
a) 60   b) 120
c) 110   d) 150

24. If 8th term of an A.P is 15, then sum of its 15 terms is   *(Scanner)*
a) 15   b) 0
c) 225   d) 225/2

25. The sum of the third and ninth term of an A.P. is 8. Find the sum of the first 11 terms of the progression.   *(Scanner)*

a) 44   b) 22
c) 19   d) 11

26. If the sum of 'n' terms of an Arithmetic Progression (A.P) is $3n^2 + 5n$ and its m^{th}term is 164, then the value of m is: *(Scanner)*
a) 27   b) 28
c) 24   d) 26

27. If a, b, c are in Arithmetic Progression (A.P.) then the value of a – b + c is: *(Scanner)*
a) a   b) -b
c) b   d) c

28. If a, b, c, d are in A.P. then
a) $a^2 – 3b^2 + 3c^2 – d^2 = 0$
b) $a^2 + 3b^2 + 3c^2 + d^2 = 0$
c) $a^2 + 3b^2 + 3c^2 – d^2 = 0$
d) None

29. If a, b, c, d, e are in A.P. then
a) a – b – d + e = 0   b) a – 2c + e = 0
c) b – 2c + d = 0   d) all the above

30. If a, b, c are in A.P. then the value of $(a^3 + 4b^3 + c^3)/ [b(a^2 + c^2)]$ is
a) 1   b) 2   c) 3   d) None

31. If a, b, c are in A.P. then the value of $(a^2 + 4ac + c^2)/(ab + bc + ca)$ is
a) 1   b) 2   c) 3   d) None

32. If a, b, c be respectively p^{th}, q^{th} and r^{th} terms of an A.P. the value of a(q – r) +b(r – p) + c(p – q) is __.
a) 0   b) 1
c) -1   d) None

33. If a, b, c be the sums of p, q, r terms respectively of an A.P. the value of (a/p) (q-r) + (b/q) (r-p) + (c/r) (p-q) is ____.
a) 0   b) 1
c) -1   d) None

34. If S_1, S_2, S_3 be the sums of n terms of three A.P.s the first term of each being unity and the respective common differences 1, 2, 3 then (S_1 + S_3) / S_2 is ____.

a) 1   b) 2   c) -1   d) None

35. If S_1, S_2, S_3 be the respectively the sum of n, 2n, 3n 6 terms an A.P. the value of $\dfrac{S_3}{(S_2 - S_1)}$ is given by.
   a) 1   b) 2   c) 3   d) None

36. The mth term of an A.P. is n and n^{th} term is m. The rth term of it is
   a) m + n + r   b) n + m – 2r
   c) m + n + r/2   d) m + n – r

37. If the Pth term of an A.P. is 'q' and the qth term is 'p', then its rth term is   *(Scanner)*
   a) p + q – r
   b) p + q + r
   c) p – q – r
   d) p – q

38. If the pth term of an A.P. is q and the qth term is p the value of the $(p + q)^{th}$ term is _____.
   a) 0   b) 1   c) -1   d) None

39. The sum of p terms of an A.P. is q and the sum of q terms is p. The sum of p + q terms is _____.
   a) - (p + q)   b) p + q
   c) $(p – q)^2$ d) $p^2 – q^2$

40. The pth term of an A.P. is 1/q and the qth term is 1/p. The sum of the pq^{th} term is _____.
   a) $\dfrac{1}{2}(pq + 1)$ b) $\dfrac{1}{2}(pq - 1)$
   c) pq + 1   d) pq – 1

Set - C

1. The sum of all two Digit odd numbers is
   (Scanner)
   a) 2475   b) 2575
   c) 4950   d) 5049

2. The sum of all odd numbers between 200 and 300 is
   a) 11, 600   b) 12,490
   c) 12,500   d) 24, 750

3. The sum of all natural numbers between 100 and 1000 which are multiple of 5 is:
   (Scanner)
   a) 98,450   b) 96,450
   c) 97,450   d) 95,450

4. Find the sum of all natural numbers between 250 and 1,000 which are exactly divisible by 3 :
   (Scanner)
   a) 1,56,375   b) 1,56,357
   c) 1,65,375   d) 1,65,357

5. The sum of all numbers between 100 and 1000 which are divisible by 11 will be:
   (Scanner)
   a) 44550   b) 66770
   c) 55440   d) 33440

6. The sum of all natural numbers between 500 and 1000 which are divisible by 13, is
   a) 28,405   b) 24,805
   c) 28,540   d) None of these

7. The sum of natural numbers upto 200 excluding those divisible by 5 is _____.
   a) 20,100   b) 4,100
   c) 16,000   d) None

8. The sum of all natural numbers from 100 to 300 which are exactly divisible by 4 and 5 is
   a) 2,200   b) 2,000
   c) 2,220   d) None of these

9. The sum of all natural numbers from 100 to 300 which are exactly divisible by 4 or 5 is
   a) 10, 200   b) 15,200
   c) 16,200   d) none of these

10. The income of a person is Rs.5,00,000 in the firm in the first year and he receives an increase of Rs.15,000 per year for next 10 years. The total amount he receives in 10 years is:
   (Scanner)
   a) Rs.56,75,000   b) Rs.72,50,000
   c) Rs.15,67,500   d) None of these

11. If each month Rs.100 increases in any sum then find out the total sum after 10 months, if the sum of first month is Rs.2,000.   *(Scanner)*

a) Rs.24,500   b) Rs.24,000
c) Rs.50,000   d) Rs.60,000

12. A man employed in a company is promised a salary of Rs.3,000 every month for the first year and an increment of Rs.1,000 in his monthly salary every succeeding year. How much does the man earn from the company in 20 years? *(Scanner)*
a) Rs.30,00,000   b) Rs.27,50,000
c) Rs.19,10,000   d) Rs.7,90,000

13. A person is employed in a company at Rs.3000 per month and he would get an increase of Rs.100 per year. Find the total amount which he receives in 25 years.
a) Rs.1,05,000   b) Rs.12,60,000
c) Rs.12,50,000   d) None

14. A contractor who fails to complete a building in a certain specified time is compelled to forfeit Rs.200 for the first day of extra time required and thereafter forfeited amount is increased by Rs.25 for every day. If he loses Rs.9,450, for how many days did he over-run the contract time? *(Scanner)*
a) 19 days   b) 21 days
c) 23 days   d) 25 days

15. A sum of Rs.6240 is paid off in 30 instalments such that each instalment is Rs.10 more than the proceeding installment. The value of the 1st instalment is
a) Rs.36   b) Rs. 30
c) Rs.60   d) none of these

16. On 1st January every year a person buys National Saving Certificates of value exceeding that of his last year's purchase by Rs.100. After 10 years, he finds that the total value of the certificates purchased by him is Rs.54,500. Find the value of certificates purchased by him in the first year: *(Scanner)*
a) Rs.6,000   b) Rs.4,000
c) Rs.5,000   d) Rs.5,500

17. A person saved Rs.16,500 in ten years. In each year after the first year he saved Rs.100 more than he did in the preceding year. The amount of money he saved in the 1st year was
a) 1000   b) Rs.1500
c) Rs.1200   d) none of these

18. A person pays Rs.975 by monthly instalment each less then the former by Rs.5. The first instalment is Rs.100. The time by which the entire amount will be paid is
a) 10 months   b) 15 months
c) 14 months   d) none of these

19. A person pays Rs.975 in monthly instalments, each instalment is less than former by Rs.5. The amount of first instalment is Rs.100. In what time will the entire amount be paid? *(Scanner)*
a) 26 months   b) 15 months
c) Both (a) & (b)   d) 18 months

20. The sum of the series – 8, -6, -4, …..n terms is 52. The number of terms n is   *(Scanner)*
a) 11   b) 12   c) 13   d) 10

Set - D

1. The sum of n terms of two A.P. s are in the ratio of (7n-5)/(5n+17). Then the ____term of the two series are equal.
a) 12   b) 6   c) 3   d) None

Geometric Progression

If the ratio of any term and its previous term is constant then the given sequence is called as geometric Progression.

1) n^{th} term of G.P. $t_n = ar^{n-1}$

2) Sum of n term of G.P

1. $S_n = \dfrac{a(r^n - 1)}{r - 1}$ when $r > 1$

2. $S_n = \dfrac{a(1 - r^n)}{1 - r}$ when $r < 1$

3. $S_n =$ (middle term) x (no. of terms)

4. If $r = 1$, $S_n = na$.

5. If $r = -1$

   $S_n = a$, n is odd

   $S_n = 0$, n is zero.

   Where a = first term, r = commo ratio, n = number of terms, Sn = sum of n terms

3. Number of numbers in G.P.

1. Two numbers in G.P a/r, ar

2. Three numbers in G.P a/r, a, ar

3. Four numbers in G.P. a/r^3, a/r, ar, ar^3

4. Five numbers in G.P. $\dfrac{a}{r^2}, \dfrac{a}{r}$, a, ar, ar^2

Part - II
G. P.
(Module + Scanner)
Set - A

1. The 7th term of the series 6, 12, 24, ...is
   a) 384   b) 834
   c) 438   d) None of these

2. t_8 of the series 6, 12, 24,.....is
   a) 786   b) 768
   c) 867   d) None of these

3. The last term of the series 1, 2, 4, ...to 10 terms is
   a) 512   b) 256
   c) 1024   d) None of these

4. t_{12} of the series -128, 64, -32, ...is
   a) -1/16   b) 16
   c) 1/16   d) None of these

5. The 4th term of the series 0.04, 0.2, 1, ...is
   a) 0.5   b) 1/2
   c) 5   d) None of these

6. The last term of the series 1, -3, 9, -27 up to 7 terms is
   a) 297   b) 729
   c) 927   d) None of these

7. The last term of the series x^2, x, 1, ...to 31 terms is
   a) x^{28} b) $1/x$
   c) $1/x^{28}$ d) None of these

8. The nth term of the series 16, 8, 4,....In $1/2^{17}$.The value of n is
   a) 20   b) 21
   c) 22   d) None of these

9. Find the no. of terms of the series
    25, 5, 1, ...$\frac{1}{3125}$ *(Scanner)*
    a) 6   b) 7   c) 8   d) 9

10. In a G.P. the sixth term is 729 and the common ratio is 3, then the first term of G.P. is: *(Scanner)*
    a) 2   b) 3   c) 4   d) 7

11. The sum of 3 numbers of a G P is 39 and their product is 729. The numbers are
    a) 3, 27, 9   b) 9, 3, 27
    c) 3, 9, 27   d) None of these

12. The product of 3 numbers in G P is 729 and the sum of squares is 819. The numbers are
    a) 9, 3, 27   b) 27, 3, 9
    c) 3, 9, 27   d) None of these

13. If the sum of three numbers in G.P. is 21 and the sum of their squares is 189 the numbers are ____.
    a) 3, 6, 12   b) 12, 6, 3
    c) Both   d) None

14. If the continued product of three numbers in G.P. is 27 and the sum of their product in pairs is 39 the numbers are ____.
    a) 1, 3, 9   b) 9, 3, 1
    c) Both   d) None

15. Find three numbers in G.P. such that their sum is 21, and the sum of their squares is 189: *(Scanner)*
    a) 5, 7, 9   b) 3, 7, 11
    c) 3, 6, 12   d) 4, 8, 9

16. Find the three numbers in G.P whose sum is 52 and the sum of their product in pairs is 624.
    a) 4, 12, 36   b) 10, 16, 26
    c) 5, 17, 30   d) None of these

17. Four geometric means between 4 and 972 are
    a) 12, 36, 108, 324   b) 12, 24, 108, 320
    c) 10, 36, 108, 320   d) None of these

18. If the third term of a G.P. is the square of the first and the fifth term is 64 the series would be ____.
    a) 4+8+16+32+....
    b) 4 – 8 + 16 – 32 + ...
    c) both
    d) None

19. The second term of a G P is 24 and the fifth term is 81. The series is
    a) 16, 36, 24, 54,..
    b) 24, 36, 53,...
    c) 16, 24, 36, 54,...
    d) None of these

Set - B

1. Sum of the series 1 + 3 + 9 + 27 + ... is 364. The number of terms is
    a) 5   b) 6
    c) 8   d) None of these

2. The number of terms to be taken so that 1 + 2 + 4 + 8 + will be 8191 is
    a) 10   b) 13
    c) 12   d) None of these

3. How many terms of the G.P. 1, 4, 16... are to be taken to have their sum 341?
    a) 8   b) 5   c) 3   d) None

4. The sum of how many terms of the sequence 256, 128, 64, ... is 511.   *(Scanner)*
    a) 8   b) 9
    c) 7   d) None of these.

5. The sum of the series -2, 6, -18, ...to 7 terms is
    a) -1094   b) 1094
    c) -1049   d) None of these

6. The sum of the series 243, 81, 27, ...to 8 terms is
    a) 36   b) $\left(36\frac{13}{30} \right)$
    c) $36\frac{1}{9}$ d) None of these

7. If you save 1 paise today, 2 paise the next day 4 paise the succeeding day and so on, then your total savings in two weeks will be
   a) Rs.163   b) Rs.183
   c) Rs.163.83   d) None of these

8. The sum of n terms of a G.P. whose first terms 1 and the common ratio is ½, is equal to $1\frac{127}{128}$.
   The value of n is
   a) 7   b)   8
   c) 6   d)   None of these

9. If the sum of n terms of a G.P. with last term 128 and common ratio 2 is 255, the value of n is ____.
   a) 8   b) 5
   c) 3   d) None

10. The least value of n for which the sum of n terms of the series $1 + 3 + 3^2 + $ ......is greater than 7000 is ____.
    a) 9   b) 10   c) 8   d) 7

11. The sum of $1 + 1/3 + 1/3^2 + 1/3^3 + ... + 1/3^{n-1}$ is
    a) 2/3   b) 3/2
    c) 4/5   d) None of these

12. The nth element of the sequence -1, 2, -4, 8 ..... is
    a) $(-1)^n 2^{n-1}$
    b) 2^{n-1}
    c) 2^n
    d) none of these

13. The sum to ∞ of the series -5, 25, -125, 625, ... Can be written as
    a) $\sum_{k=1}^{\infty}(-5)^k$ b) $\sum_{k=1}^{\infty}5^k$

    c) $\sum_{k=1}^{\infty}-5^k$ d) none of these

14. The sum of the series 1-1+1-1+1-1+.... to 100 terms is equal to
    a) 1   b) -1
    c) 0   d) 50

15. The sum of the series 1 + 2 + 4 + 8 + ..to n term
    a) $2^n - 1$
    b) 2n – 1
    c) $1/2^n - 1$
    d) None of these

16. The least value of n for which $\frac{1}{2} + \frac{1}{2^2} + \cdots \frac{1}{2^6} >$ 0.998
    a) 9   b) 10
    c) 7   d) 8

17. If x, y, z are in G.P., then
    a) $y^2 = xz$ b) $y(z^2 + x^2) = x(z^2 + y^2)$
    c) 2y = x + z   d) None of these

18. If x, y, z are the terms in G.P. then the terms $x^2 + y^2$, xy + yz, $y^2 + z^2$ are in: *(Scanner)*
    a) A.P.   b) G.P.
    c) H.P.   d) None of these

19. If a, b, c are in G.P. then the value of $a(b^2+c^2)-c(a^2+b^2)$ is ____.
    a) 0   b) 1
    c) -1   d) None

20. If a, b, c, d are in G.P. then the value of $b(ab-cd)-(c+a)(b^2-c^2)$ is ____
    a) 0   b) 1
    c) -1   d) None

21. If a, b, c, d are in G.P. then the value of $(ab+bc+cd)^2-(a^2+b^2+c^2)(b^2+c^2+d^2)$ is ____
    a) 0   b) 1
    c) -1   d) None

22. If a, b, c, d are in G.P. then a+b, b+c, c+d are in
    a) A.P.   b) G.P.
    c) H.P.   d) None

23. If a, b, c are in G.P. then $a^2 + b^2$, ab+bc, b^2+c^2 are in
    a) A.P.   b) G.P.
    c) H.P.   d) None

24. If a, b, c are in G.P. then the value of (a-b+c)$(a+b+c)^2-(a+b+c)(a^2+b^2+c^2)$ is given by
    a) 0   b) 1
    c) -1   d) None

25. If a, b, c are in G.P. then the value of $a(b^2+c^2)-c(a^2+b^2)$ is given by
    a) 0   b) 1   c) -1   d) None

26. If a, b, c are in G.P. then the value of $a^2b^2c^2(a^{-3}+b^{-3}+c^{-3})-(a^3+b^3+c^3)$ is given by
    a) 0   b) 1   c) -1   d) None

27. If a, b, c, d are in G.P. then $(a-b)^2$, $(b-c)^2$, $(c-d)^2$ are in
    a) A.P.   b) G.P.   c) H.P.   d) None

28. If a, b, c, d are in G.P. then the value of $(b-c)^2+(c-a)^2+(d-b)^2-(a-d)^2$ is given by
    a) 0   b) 1   c) -1   d) None

29. If a, b, c are the pth, q^{th} and r^{th} terms of a G.P. respectively the value of $a^{q-r}.b^{r-p}.c^{p-q}$ is ____
    a) 0   b) 1   c) -1   d) None

30. In a G.P. if the $(p+q)^{th}$ term is m and the $(p-q)^{th}$ term is n then the pth term is ____.
    a) $\sqrt{(mn)}$ b) mn
    c) (m+n)   d) (m-n)

31. In a G.P, the product of the first three terms 27/8. The middle term is
    a) 3/2   b) 2/3
    c) 2/5   d) None of these

32. In a G.P. If the fourth term is '3' then the product of first seven terms is: *(Scanner)*
    a) 3^5 b) 3^7 c) 3^6 d) 3^8

33. The 3rd term of a G.P. is $\dfrac{2}{3}$ and the 6th term is $\dfrac{2}{81}$, then the 1st term is   *(Scanner)*
    a) 6   b) $\dfrac{1}{3}$
    c) 9   d) 2

Set – C

1. The population of a country was 55 crore in 2005 and is growing at 2% p.a C.I. the population is the year 2015 is estimated as
    a) 57.05 crore   b) 60.05 crore
    c) 67.05 crore   d) None of these

2. At 10% C.I. p.a., a sum of money accumulate to Rs.9625 in 5 years. The sum invested initially is
    a) Rs.5976   b) Rs.5970
    c) Rs.5870   d) Rs.5370

3. A person borrows Rs.8,000 at 2.76% Simple Interest per annum. The principal and the interest are to be paid in the 10 monthly instalments. If each instalment is double the preceding one, find the value of the last instalment.
    a) 4090   b) 4096
    c) 4095   d) None

4. If (a-b), (b-c), (c-a) are in G.P. then the value of $(a+b+c)^2-3(ab+bc+ca)$ is given by
    a) 0   b) 1
    c) -1   d) None

5. The sum of the first 20 terms of a G.P is 244 times the sum of its first 10 terms. The common ratio is
    a) $\pm\sqrt{3}$ b) ± 3
    c) $\sqrt{3}$ d) None of these

6. The sum of first eight terms of G.P. is five times the sum of the first four terms. The common ratio is ____.
    a) $\sqrt{2}$ b) $-\sqrt{2}$
    c) both   d) None

7. The sum of first 20 terms of a GP is 1025 times the sum of first 10 terms of same GP then common ratio is: *(Scanner)*
    a) $\sqrt{2}$ b) 2
    c) $2\sqrt{2}$ d) 1/2

8. The sum of the series $\dfrac{1}{\sqrt{3}}+1+\dfrac{3}{\sqrt{3}}+....$ to 18 terms is
    a) $9841\,\dfrac{(1+\sqrt{3})}{\sqrt{3}}$ b) 9841
    c) $\dfrac{9841}{\sqrt{3}}$ d) None of these

Sum of infinite terms of geometric Progression

$$S_\infty = \frac{a}{1-r}, \quad |r| < 1.$$

Part - III
S ∞ For G.P.
(Module + Scanner)
Set - A

1. The number 2.353535 ___ in $\frac{p}{q}$ form is:

    (Scanner)

    a) $\frac{235}{99}$ 　　　　 b) $\frac{234}{99}$

    c) $\frac{230}{99}$ 　　　　 d) $\frac{233}{99}$

2. The sum upto infinity of the series 4 + 0.8 + 0.16 + ... is
    a) 5 　　　　　　 b) 10
    c) 8 　　　　　　 d) None

3. The sum upto infinity of the series 1/2 + 1/6 + 1/18 + ... is
    a) 3/4 　　　　　 b) 1/4
    c) 1/2 　　　　　 d) None

4. The sum of the infinite G.P.

    $1+\dfrac{1}{3}+\dfrac{1}{9}+\dfrac{1}{27}+\dots$ is equal to: *(Scanner)*

    a) 1.95 　　　　　 b) 1.5
    c) 1.75 　　　　　 d) None of these

5. Find the sum of the infinite terms $2,\dfrac{4}{y},\dfrac{8}{y^2},\dfrac{16}{y^3}......$; if y > 2   *(Scanner)*

    a) $\dfrac{2y}{y-2}$ 　　　　 b) $\dfrac{4y}{y-2}$

    c) $\dfrac{3y}{y-2}$ 　　　　 d) None of these.

6. The sum of the infinite G.P. 1 – 1/3 + 1/9 – 1/27 + ... is
    a) 0.33 　　　　　 b) 0.57
    c) 0.75 　　　　　 d) None of these

7. The sum of the infinite GP 14, -2, +2/7, -2/49, + ... is
    a) $4\dfrac{1}{12}$ 　　　　 b) $12\dfrac{1}{4}$
    c) 12 　　　　　　 d) None of these

8. If the first term of a G.P. exceeds the second term by 2 and the sum to infinity is 50 the series is ___.
    a) 10, 8, 32/5...
    b) 10, 8, 5/2 ....
    c) 10, 10/3, 10/9...
    d) None

Set - B

1. The sum upto infinity of the series $\sqrt{2}+1/\sqrt{2}+1/(2\sqrt{2})+\dots\dots$is
    a) $2\sqrt{2}$ 　　　　　 b) 2
    c) 4 　　　　　　 d) None

2. Sum upto∞ of the series $8+4\sqrt{2}+4+\dots$is
    a) $8(2+\sqrt{2})$ 　　　 b) $8(2-\sqrt{2})$
    c) $4(2+\sqrt{2})$ 　　　 d) $4(2-\sqrt{2})$

3. The sum upto infinity of the series $(\sqrt{2}+1)+1+(\sqrt{2}-1)+\dots$ is
    a) $(1/2)(4+3\sqrt{2})$
    b) $(1/2)(4-3\sqrt{2})$
    c) $4+3\sqrt{2}$
    d) None

4. The sum upto infinity of the series $(1+2^{-2})+(2^{-1}+2^{-4})+(2^{-2}+2^{-6})+$ ...... is
    a) 7/3 　　　　　 b) 3/7
    c) 4/7 　　　　　 d) None

5. Sum upto∞ of the series $1/2+1/3^2+1/2^3+1/3^4+1/2^5+1/3^6+\dots$is
    a) 19/24 　　　　 b) 24/19
    c) 5/24 　　　　　 d) None

6. The sum upto infinity of the series 2/3 + 5/9 + 2/27 + 5/81 + ... Is
    a) 11/8   b) 8/11
    c) 3/11   d) None

7. The sum upto infinity of the series 4/7-$5/7^2$+4/7^3-5/7^4 + ... is
    a) 23/48   b) 25/48
    c) 1/2   d) None

8. Sum upto infinity of series.
    $\frac{1}{2} + \frac{1}{3^2} + \frac{1}{2^3} + \frac{1}{3^4} + \frac{1}{2^5} + $ .... *(Scanner)*
    a) 19/24   b) 24/19
    c) 5/24   d) None

9. If $x = 1 + \frac{1}{3} + \frac{1}{3^2} + ...\infty$

    $y = 1 + \frac{1}{4} + \frac{1}{4^2} + ...\infty$

    Find xy.   *(Scanner)*
    a) 2   b) 1
    c) 8/9   d) ½

10. If the sum of infinite terms in a G.P. is 2 and the sum of their squares is 4/3 the series is
    a) 1, 1/2, 1/4 .....
    b) 1, -1/2, 1/4 .....
    c) -1, -1/2, -1/4 .....
    d) None

11. The first term of a G.P. where second term is 2 and sum of infinite term is 8 will be:
                                    (Scanner)
    a) 6   b) 3   c) 4   d) 1

12. Find the product of :
    (243), (243)$^{1/6}$, (243)$^{1/36}$, ... *(Scanner)*
    a) 1,024
    b) 27
    c) 729
    d) 246

13. The sum of terms of an infinite GP is 15. And the sum of the squares of the term is 45. Find the common ratio.   *(Scanner)*
    a) 3/2   b) 1
    c) -2/3   d) 2/3

Set - C

1. If y = 1 + x + x^2 + ... ∞ then x =
                                    (Scanner)
    a) $\frac{y-1}{y}$ b) $\frac{y+1}{y}$

    c) $\frac{y}{y+1}$ d) $\frac{y}{y-1}$

2. If $1+a+a^2+....$ ∞ = x and $1+b+b^2+.....\infty$ = y then $1 + ab + a^2b^2+......\infty$ = z, then z is given by _____.
    a) (xy)/(x+y-1)   b) (xy)/(x-y-1)
    c) (xy)/(x+y+1)   d) None

3. If x = a + a/r + a/r^2 + ...∞, y = b − b/r + b/r^2 - ......∞, and z = c + c/r^2 + c/r^4 + ...∞, then the value of $\frac{xy}{z} - \frac{ab}{c}$ is
    a) 0   b) 1
    c) -1   d) None

4. If S_1, S_2, S_3, ...S_n are the sums of infinite G.P.s whose first terms are 1, 2, 3 .... N and whose common ratios are ½, 1/3, ...1/(n+1) then the value of $S_1+S_2+S_3+ ....S_n$ is
    a) (n/2) (n+3)   b) (n/2) (n+2)
    c) (n/2) (n+1)   d) $n^2/2$

5. A certain ball when dropped to the ground rebounds to $\frac{4^{th}}{5}$ of the height from which it falls; it is dropped from a height of 100 metres find the total distance it travels before finally coming to rest:
    a) 600m   b) 700m
    c) 900m   d) 200m

Some Formula

Synopsis :

If a & b are the 2 number then :

1) A.M = $\frac{a+b}{2}$

2) G. M. = $\sqrt{ab}$

3) H.M. = $\frac{2ab}{a+b}$

4) A. M. $\geq$ G. M. $\geq$ H. M.

5) $(G.M.)^2$ = A. M. x H. M.

   i.e. G.M. is the geometric mean between A.M. & H. M.

6) If a & b are unequal then A. M. > G. M. > H. M.

7) Quadratic Equations having a and b as its roots is, $x^2 = 2Ax + G^2 = 0$.

8) If 'n' means are inserted between a & b then the sum of the means is $\frac{n\,(a+b)}{2}$.

Part - IV

Means

(Module + Scanner)

Set - A

1. The arithmetic mean between 33 and 77 is
   a) 50   b) 45
   c) 55   d) none of these

2. The A.M. of two positive numbers is 40 and their G. M. is 24. The numbers are
   a) (72, 8)   b) (70, 10)
   c) (60, 20)   d) None of these

3. The sum of four numbers in G. P. is 60 and the A.M. of the first and the last is 18. The numbers are
   a) 4, 8, 16, 32   b) 4, 16, 8, 32
   c) 16, 8, 4, 20   d) None of these

4. If the terms 2x, (x+10) and (3x+2) be in A.P., the value of x is
   a) 7   b) 10
   c) 6   d) None of these

5. (x + 1), 3x, (4x + 2) are in A.P. Find the value of x   *(Scanner)*
   a) 2   b) 3
   c) 4   d) 5

6. The value of K, for which the terms 7K + 3, 4K – 5, 2K + 10 are in A.P., is   *(Scanner)*
   a) 13   b) - 13

c) 23   d) -23

7. The value of x such that 8x + 4, 6x – 2, 2x + 7 will form an AP is
   a) 15   b) 2
   c) 15/2   d) none of the these

8. Find two numbers whose A.M. is 10 and G.M. is 8.   *(Scanner)*
   a) [10, 10]   b) [16, 4]
   c) [18, 2]   d) [14, 6]

9. Find the two numbers whose geometric mean is 5 and arithmetic mean in 7.5.   *(Scanner)*
   a) 10 and 5   b) 13.09 and 1.91
   c) 12 and 3   d) None of the above

10. If the AM and GM of two numbers is 6.5 and 6 the no. s' are :   *(Scanner)*
    a) 3 and 2   b) 9 and 4
    c) 81 and 16   d) None

11. Find the numbers whose arithmetic mean is 12.5 and geometric mean is 10.   *(Scanner)*
    a) 20 and 5   b) 10 and 5
    c) 5 and 4   d) None of these

12. If AM and HM for two numbers are 5 and 3.2 respectively. GM will be: *(Scanner)*
    a) 20   b) 16
    c) 4   d) 5

13. If A be the A.M. of two positive unequal quantities x and y and G be their G.M, then
    a) A < G   b) A > G
    c) A ≥ G   d) A ≤ G

14. A.M is never _____ than G.M.
    a) more   b) less
    c) maximum   d) minimum

15. t_4 of a G.P. in x, t_{10} = y and t_{16} = z. Then
    a) $x^2 = yz$ b) $z^2 = xy$
    c) $y^2 = zx$ d) none of these

16. If a, b, x, y, z are positive numbers such that a, x, b are in A.P. and a, y, b are in G.P. and z=(2ab)/(a+b) then
    a) x, y, z are in G.P.   b) x≥ y ≥ z
    c) both   d) None

Set - B

1. If Geometric mean (G.M.) of a, b, c, d is 3, then G.M. of $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}, \frac{1}{d}$ will be: *(Scanner)*
    a) 1/3
    b) 3
    c) 81
    d) 1/81

2. If G be Geometric Mean between two numbers a and b, then the value of $\frac{1}{G^2 - a^2} + \frac{1}{G^2 - b^2}$ is
    equal to   *(Scanner)*
    a) G^2 b) $3 G^2$
    c) $1/G^2$ d) 2/G2

3. Geometric Mean of P, P^2, P^3 ...., P^n:
                          (Scanner)
    a) P^{n+1} b) $P^{\frac{1+n}{2}}$
    c) $P^{\frac{n(n+1)}{2}}$ d) None of the above

4. Between the two numbers whose sum is $\frac{13}{6}$, an even number of A.M is inserted. If the sum of arithmetic mean exceeds their number by unity, then number of arithmetic means inserted are –

a) 6   b) 10
c) 8   d) 12

Part - V
A.P + G.P
(Module + Scanner)
Set - A

1. The sum of three numbers in G.P. is 70. If the two extremes by multiplied each by 4 and the mean by 5, the products are in AP. The numbers are
    a) 12, 18, 40
    b) 10, 20, 60
    c) 40, 20, 10
    d) None of these

2. Three numbers are in AP and their sum is 21. If 1, 5, 15 are added to them respectively, they form a G.P. The numbers are
    a) 5, 7, 9   b) 9, 5, 7
    c) 7, 5, 9   d) None of these

3. Three numbers whose sum is 15 are in A.P. but if they are added by 1, 4, 19 respectively they are in G.P. The numbers are ___.
    a) 2, 5, 8   b) 26, 5, -16
    c) Both   d) None

4. The numbers x, 8, y are in G.P. and the numbers x, y, -8 are in A.P. The values of x, y are ____.
    a) 16, 4   b) 4, 16
    c) both   d) None

5. The numbers x, 8, y are in G.P. and the numbers x, y, -8 are in A.P. The value of x and y are
    a) (-8, -8)   b) (16, 4)
    c) (8, 8)   d) Both A & B

6. If a, b, c are in A.P. and x, y, z in G.P. then the value of $x^{b-c} \cdot y^{c-a} \cdot z^{a-b}$ is ____
    a) 0   b) 1
    c) -1   d) None

7. If a, b, c are in A.P. and x, y, z are in G.P, then the value of $x^{(b-c)} \cdot y^{(c-a)} \cdot z^{(a-b)}$ is: *(Scanner)*
    a) 1   b) 0
    c) b(c – a)   d) None

8. If a, b, c are in A.P. and x, y, z in G.P. then the value of $(x^b.y^c.z^a) \div (x^c.y^a.z^b)$ is _____
    a) 0
    b) 1
    c) -1
    d) None

9. If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P; the x, y, z are in: *(Scanner)*
    a) A.P.
    b) G.P.
    c) Both (a) & (b)
    d) None

10. The sum of 3 numbers in A.P. is 15. If 1, 4 and 19 be added to them respectively, the results are is G.P. The numbers are
    a) 26, 5, -16
    b) 2, 8, 5
    c) 5, 8, 2
    d) None of these

11. If p, q and r are in A.P. and x, y, z are in G.P. then $x^{q-r}. y^{r-p}. z^{p-q}$ is equal to
    a) 0
    b) -1
    c) 1
    d) None of these

12. Given x, y, z are in G.P. and $x^p = y^q = z^\sigma$, then 1/p, 1/q, 1/σ are in
    a) A.P.
    b) G.P.
    c) Both A.P. and G.P.
    d) None of these

13. If a, b, c are in A.P. a, x, b are in G.P. and b, y, c are in G.P then x^2, b^2, y^2 are in
    a) A.P.   b) G.P.
    c) H.P.   d) None

14. If a, b-a, c-a are in G.P. and a=b/3=c/5 then a, b, c are in
    a) A.P.   b) G.P.
    c) H.P.   d) None

15. If x, y, z are in A.P. and x, y, (z + 1) are in G.P. then
    a) $(x - z)^2 = 4x$
    b) $z^2 = (x - y)$
    c) z = x − y
    d) none of these

Set - C

1. The first, second and seventh term of A.P. are in G.P. and the common difference is 2, the 2nd term of A.P. is: *(Scanner)*
    a) 5/2   b) 2
    c) 3/2   d) ½

2. The sum of three numbers in a geometric progression is 28. When 7.2 and 1 are subtracted from the first, second and third numbers respectively, then the resulting numbers are in arithmetic progression. What is the sum of squares of the original three numbers?
    a) 510   b) 456
    c) 400   d) 336

Basic Summation

1. $\sum\limits_{n=1}^{n} n = 1 + 2 + 3 + \ldots + n = \dfrac{n(n+1)}{2}$

2. $\sum\limits_{n=1}^{n} n^2 = 1^2 + 2^2 + 3^2 + \ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$

3. $\sum\limits_{n=1}^{n} n^3 = 1^3 + 2^3 + 3^3 + \ldots + n^3 = \left[\dfrac{n(n+1)}{2}\right]^2$

4. Sum S_n of first n odd numbers = n^2.

Part – VI
Special Series
(Module + Scanner)
Set - A

1. $\sum n^2$ defines:
   a) $\dfrac{n(n+1)(2n+1)}{6}$ b) $\dfrac{n(n+2)}{2}$

   c) $\left[\dfrac{n(n+1)}{2}\right]^2$ d) None of these

2. The value of $1^3 + 2^3 + 3^3 + 4^3 + \ldots + m^3$ is equal to:
   a) $\left[\dfrac{m(m+1)}{2}\right]^3$ b) $\dfrac{m(m+1)(2m+1)}{6}$

   c) $\left[\dfrac{m(m+1)}{2}\right]^2$ d) None of these.

3. The sum of n terms of the series $1 + (1 + 3) +$ $(1 + 3 + 5) + \ldots\ldots\ldots$ is

   a) $\dfrac{n(n+1)(2n+1)}{6}$ b) $\dfrac{n(n+1)(n+2)}{6}$

   c) $\dfrac{n(n+1)(2n+1)}{3}$ d) None of these

4. The sum of n terms of the series $1 + 3 + 5 +$ ...is
   a) n^2 b) $2n^2$
   c) $n^2/2$ d) None

5. The sum of n terms of the series $2 + 6 + 10 +$ ...is
   a) $2n^2$ b) n^2

   c) $n^2/2$ d) $4n^2$

6. The sum to m terms of the series $1 + 11 + 111 + \ldots$ upto m terms, is equal to

   a) $\dfrac{1}{81}(10^{m+1} - 9m - 10)$

   b) $\dfrac{1}{27}(10^{m+1} - 9m - 10)$

   c) $10^{m+1} - 9m - 10$

   d) None of these

7. Sum of n terms of the series $4 + 44 + 444 + \ldots$ is
   a) $4/9 \{10 / 9 (10^n - 1) - n\}$
   b) $10/9 (10^n - 1) - n$
   c) $4/9 (10^n - 1) - n$
   d) None of these

8. Find the sum to n terms of the series : $7 + 77 + 777 + \ldots\ldots$ to n terms:

   a) $\dfrac{7}{9}(10^{n+1} - 10) - \dfrac{7n}{9}$

   b) $\dfrac{7}{9}(10^{n+1} - 10) + \dfrac{7n}{9}$

   c) $\dfrac{7}{81}(10^{n+1} - 10) - \dfrac{7n}{9}$

   d) $\dfrac{7}{81}(10^{n+1} - 10) + \dfrac{7n}{9}$

9. Sum of n terms of the series $0.1 + 0.11 + 0.111 + \ldots$ is

a) $1/9 \{n - (1 - (0.1)^n)\}$
b) $1/9 \{n - (1 - (0.1)^n)/9\}$
c) $n - 1 - (0.1)^n / 9$
d) None of these

10. The sum of the series:
0.5 + 0.55 + 0.555 + ... to n terms is:

a) $\dfrac{5n}{9} + \dfrac{5}{9}[1-(0.1)^n]$

b) $\dfrac{5n}{9} - \dfrac{5}{81}[1-(0.1)^n]$

c) $\dfrac{5n}{9} + \dfrac{5}{81}[1-(0.1)^n]$

d) $\dfrac{5n}{9} + \dfrac{5}{81}[1+(0.1)^n]$

11. The sum of $1.03 + (1.03)^2 + (1.03)^3 + ...$ To n terms is
a) $103 \{(1.03)^n - 1\}$
b) $103/3 \{(1.03)^n - 1\}$
c) $(1.03)^n - 1$
d) None of these

12. The sum of n terms of the series 0.3 + 0.03 + 0.003 + ... is
a) $(1/3) (1-1/10^n)$ b) $(1/3) (1+1/10^n)$
c) both   d) None

13. The sum of n terms of the series 1 + 5 + 12 + 22 + ...is
a) $(n^2/2)(n+1)$ b) $n^2 (n+1)$
c) $(n^2/2)(n-1)$ d) None

14. The sum of n terms of the series 1.4 + 3.7 + 5.10 + ... is
a) $\dfrac{n}{2}(4n^2 + 5n - 1)$ b) $(n/2)(5n^2+4n-1)$
c) $(n/2)(4n^2+5n+1)$ d) None

15. The sum of n terms of the series $1^2+3^2+5^2+....$is
a) $\dfrac{n}{3}(4n^2 - 1)$ b) $n^2(2n^2+1)$
c) $n(2n-1)$ d) $n(2n+1)$

16. The sum of n terms of the series $2^2+5^2+8^2+......$is

a) $(n/2) (6n^2+3n-1)$
b) $(n/2) (6n^2-3n-1)$
c) $(n/3) (6n^2+3n-1)$
d) None

17. The sum of n terms of the series 1.2+2.3+3.4 + ...is
a) $(n/3) (n + 1) (n + 2)$
b) $(n/2) (n + 1) (n + 2)$
c) $(n/5) (n + 1) (n + 2)$
d) None

18. The sum of n terms of 1.4, 3.7, 5.10 ..... is
a) $(n/2) (4n^2+5n-1)$
b) $n(4n^2+5n-1)$
c) $(n/2) (4n^2-5n-1)$
d) None

19. The sum of n terms of $1^2,3^2,5^2,7^2,......$is
a) $(n/3) (4n^2-1)$
b) $(n/2) (4n^2-1)$
c) $(n/3) (4n^2+1)$
d) None

20. The sum of n terms of 1, (1 + 2), (1 + 2 + 3) ...... is
a) $(n/3) (n + 1) (n - 2)$
b) $(n/3) (n + 1) (n + 2)$
c) $n(n + 1) (n + 2)$
d) None

21. The sum of n terms of the series 2.4.6 + 4.6.8 + 6.8.10 + ...is
a) $2n(n^3+6n^2+11n+6)$
b) $2n(n^3-6n^2+11n-6)$
c) $n(n^3+6n^2+11n+6)$
d) $n(n^3+6n^2+11n-6)$

22. The sum of n terms of the series $1.3^2+4.4^2+7.5^2+10.6^2 +....$is
a) $(n/12) (n+1) (9n^2+49n+44)-8n$
b) $(n/12) (n+1) (9n^2+49n+44)+8n$
c) $(n/6) (2n+1) (9n^2+49n+44)-8n$
d) None

23. The sum of n terms of the series 4 + 6 + 9 + 13 .... Is
a) $(n/6) (n^2+3n+20)$
b) $(n/6) (n + 1) (n + 2)$

c) $(n/3)$ $(n + 1)$ $(n + 2)$
d) None

24. The sum of n terms of the series 1.2.3 + 2.3.4 + 3.4.5 + ...is
   a) $(n/4)$ $(n+1)$ $(n+2)$ $(n+3)$
   b) $(n/3)$ $(n+1)$ $(n+2)$ $(n+3)$
   c) $(n/2)$ $(n+1)$ $(n+2)$ $(n+3)$
   d) None

25. The sum of n terms of the series $2.3^2+5.4^2+8.5^2+....$is
   a) $n/12)$ $(9n^3+62n^2+123n+22)$
   b) $(n/12)$ $(9n^3-62n^2+123n-22)$
   c) $(n/6)$ $(9n^3+62n^2+123n+22)$
   d) None

26. The sum of n terms of the series $1 + (1 + 3) + (1 + 3 + 5) +.....$is
   a) $(n/6)$ $(n + 1)$ $(2n + 1)$
   b) $(n/6)$ $(n + 1)$ $(n + 2)$
   c) $(n/6)$ $(n + 1)$ $(2n + 1)$
   d) None

27. The sum of n terms of the series $1^2+(1^2+2^2)+(1^2+2^2+3^2)+.....$is
   a) $(n/12)$ $(n + 1)^2$ $(n + 2)$
   b) $(n/12)$ $(n - 1)^2$ $(n + 2)$
   c) $(n/12)$ $(n^2 - 1)$ $(n + 2)$
   d) None

28. The sum of n terms of the series 4 + 14 + 30 + 52 + 80 + ...is
   a) $n(n+1)^2$ b) $n(n-1)^2$
   c) $n(n^2-1)$ d) None

29. The sum of n terms of the series $1/1+1/(1+2)+1/(1+2+3)+......$is
   a) $2n(n+1)^{-1}$ b) $n(n+1)$
   c) $2n(n-1)^{-1}$ d) None

30. The sum of n terms of the series $1/(3.8)+1/(8.13)+1/(13.18)+.....$is
   a) $(n/3)$ $(5n+3)^{-1}$ b) $(n/2)$ $(5n+3)^{-1}$
   c) $(n/2)$ $(5n-3)^{-1}$ d)   None

31. The sum of n terms of the series $1/(4.9)+1/(9.14)+1/(14.19)+1/(19.24)+....$is
   a) $(n/4)$ $(5n+4)^{-1}$ b) $(n/4)$ $(5n+4)$
   c) $(n/4)$ $(5n-4)^{-1}$ d) None

32. The sum to n terms of the series 11, 23, 59, 167 ..... is
   a) $3^{n+1}+5n-3$ b) $3^{n+1}+5n+3$
   c) $3^n + 5n - 3$ d) None

33. The sum of n terms of the series $1.2+3.2^2+5.2^3+7.2^4+.....$is
   a) $(n-1)2^{n+2}-2^{n+1}+6$ b) $(n+1)2^{n+2}-2^{n+1}+6$
   c) $(n-1)2^{n+2}-2^{n+1}-6$ d) None

34. $2^{4n}-1$ is divisible by
   a) 15   b) 4
   c) 6   d) 64

35. $n(n-1)(2n-1)$ is divisible by
   a) 15   b) 4
   c) 6   d) 64

36. 3^n-2n-1 is divisible by
   a) 15   b) 4
   c) 6   d) 64

37. $7^{2n}+16n-1$ is divisible by
   a) 15   b) 4
   c) 6   d) 64

Set - B

1. The sum of n terms of the series $1^2/1+(1^2+2^2)/(1+2)+(1^2+2^2+3^2)/(1+2+3)+.....$is
   a) $(n/3)(n+2)$ b) $(n/3)(n+1)$
   c) $(n/3)(n+3)$ d) None

2. The sum of n terms of the series whose n^{th} term $n.2^n$ is is given by
   a) $(n-1)2^{n+1}+2$ b) $(n+1)2^{n+1}+2$
   c) $(n-1)2^n+2$ d) None

3. The sum of n terms of the series whose n^{th} term $5.3^{n+1}+2n$ is is given by
   a) $(5/2)(3^{n+2}-9)+n(n+1)$
   b) $(5/3)(3^{n+2}-9)+n(n+1)$
   c) $(5/2)(3^{n+2}+9)+n(n+1)$
   d) None

4. The sum of n terms of the series whose n^{th} term $3n^2+2n$ is is given by
   a) $(n/2)(n+1)(2n+3)$
   b) $(n/2)(n+1)(3n+2)$

c) $(n/2)(n+1)(3n-2)$

d) $(n/2)(n+1)(2n-3)$

5. The sum of n terms of the series $1^3/1+(1^3+2^3)/2+(1^3+2^3+3^3)/3+....$is
   a) $(n/48)(n+1)(n+2)(3n+5)$
   b) $(n/24)(n+1)(n+2)(3n+5)$
   c) $(n/48)(n+1)(n+2)(5n+3)$
   d) None

6. The sum of n terms of the series $1+(1+1/3)+(1+1/3+1/3^2)+........$is
   a) $(3/2)(1-3^{-n})$ b) $(3/2)[n-(1/2)(1-3^{-n})]$
   c) Both   d) None

7. The nth terms of the series is $1/(4.7)$ + $1/(7.10)+1/(10.13)+$ .... Is
   a) $(1/3)[(3n+1)^{-1} - (3n+4)^{-1}]$
   b) $(1/3)[(3n-1)^{-1} - (3n+4)^{-1}]$
   c) $(1/3)[(3n+1)^{-1} - (3n-4)^{-1}]$
   d) None

8. In question No. (7) the sum of the series upto n is
   a) $(n/4)(3n+4)^{-1}$ b) $(n/4)(3n-4)^{-1}$
   c) $(n/2)(3n+4)^{-1}$
   d) None

9. Sum the series $\frac{1}{5}, \frac{1}{5^2}, \frac{1}{5^3} .... \frac{1}{5^n}$
   a) $\frac{1}{4}\left[1 - \left(\frac{1}{5}\right)^n\right]$

   b) $\frac{1}{5}\left[1 - \left(\frac{1}{4}\right)^n\right]$

   c) Both

   d) None

10. Find the sum to n terms of $(1-1/n) + (1-2/n) +$ $(1-3/n) +$ ....
    a) ½(n-1)   b) ½(n + 1)
    c) (n – 1)   d) (n + 1)

11. The sum of n terms of $(1/n)(n-1)$, $(1/n)(n-2)$, $(1/n)(n-3)$.... Is
    a) 0   b) $(1/2)(n-1)$
    c) $(1/2)(n+1)$ d) None

12. The sum of n terms of the series $n.1+(n-1).2+(n-2).3+$ ....is
    a) $(n/6)(n+1)(n+2)$ b) $(n/3)(n+1)(n+2)$

c) $(n/2)(n+1)(n+2)$ d) None

Set - C

1. The sum of n terms of the series is $1/\sqrt{3}+1+3/\sqrt{3}+....$
   a) $(1/6) (3+\sqrt{3}) (3^{n/2} - 1)$
   b) $(1/6) (\sqrt{3}+1) (3^{n/2} - 1)$
   c) $(1/6) (3+\sqrt{3}) (3^{n/2} + 1)$
   d) None

2. The sum of n terms of a+b, 2a, 3a-b, ...is
   a) $n(a-b)+2b$ b) $n(a+b)$
   c) both the above   d) None

3. The arithmetic mean of the square of first 2n natural numbers is:
   a) $\frac{1}{6}(2n+1)(4n-1)$

   b) $\frac{1}{6}(2n-1)(4n-1)$

   c) $\frac{1}{6}(2n-1)(4n+1)$

   d) $\frac{1}{6}(2n+1)(4n+1)$

4. The sum of n terms of $(x + y)^2$, $(x^2 + y^2)$, $(x - y)^2$,.. is
   a) $(x + y)^2 - 2(n - 1)xy$
   b) $n(x + y)^2 - n(n - 1)xy$
   c) both the above
   d) None

5. The sum of n terms of the series $5/2 - 1 + 2/5$ - .... Is
   a) $(1/14) (5^n + 2^n)/5^{n-2}$
   b) $(1/14) (5^n - 2^n)/5^{n-2}$
   c) both
   d) None

Part - VII
Other

Set - A

1. $\sum_{i=4}^{7} \sqrt{2i-1}$ can be written as
    a) $\sqrt{7} + \sqrt{9} + \sqrt{11} + \sqrt{13}$
    b) $2\sqrt{7} + 2\sqrt{9} + 2\sqrt{11} + 2\sqrt{13}$
    c) $2\sqrt{9} + 2\sqrt{7} + 2\sqrt{11} + 2\sqrt{13}$
    d) none of these

2. The first three terms of sequence when nth term t_n is $n^2 - 2n$ are
    a) -1, 0, 3   b) 1, 0, 2
    c) -1, 0, -3   d) none of these

3. If S_n the sum of first n terms in a series is given by $2n^2 + 3n$ the series is in _____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

4. If a b c are in A.P. then (b + c), (c + a), (a + b) are in ____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

5. If a, b, c are in A.P. as well as in G.P. then –
    a) They are also in H.P. (Harmonic Progression)
    b) Their reciprocals are in A.P.
    c) Both (a) and (b) are true
    d) Both (a) and (b) are false

Set - B

1. If a, b, (c+1) are in G.P. and a = $(b-c)^2$ then a, b, c are in
    a) A.P.   b) G.P.
    c) H.P.   d) None

2. If a, b, c are in A.P. then $a^2(b + c)$, $b^2 (c + a)$, $c^2(a + b)$ are in ____
    a) A.P.   b) G.P.
    c) H.P.   d) None

3. If a, b, c are in A.P. then (a/bc) (b + c), (b/ca) (c + a), (c/ab) (a + b) are in _____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

Set – C

1. If $(b + c)^{-1}$, $(c + a)^{-1}$, $(a + b)^{-1}$ are in A.P. then a^2, b^2, c^2 are in _____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

2. If a^2, b^2, c^2 are in A.P. then (b + c), (c + a), (a + b) are in _____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

3. If 'S' be the sum, 'P' the product and 'R' the sum of the reciprocals of n terms in a G.P. then 'P' is the ____of S^n and R^{-n}.
    a) Arithmetic Mean   b) Geometric Mean
    c) Harmonic Mean   d) None

Set - D

1. If $(b - c)^2$, $(c - a)^2$, $(a - b)^2$ are in A.P. then (b – c), (c – a), (a – b) are in ____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

2. If (b + c – a)/a, (c + a – b)/b, (a + b – c)/c are in A.P. then a, b, c are in ____.
    a) A.P.   b) G.P.
    c) H.P.   d) None

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7. SETS RELATION AND FUNCTIONS

Synopsis :

Sets :

A set is a collection of well defined objects. Set is always denoted by capital letters and elements of set are denoted by small letters.

Methods of describing a set is

1.   Roster Method (List Method, Tabular Method) and
2.   Set Builder form (Rule Method and Algebraic Method)

➢ Under Roster method we just make a list of all elements of the set and put them under **{ }**
➢ Set builder method consist of listing the properties common to all the element of the set.

Type of Sets

1. Null set (Empty set, Void Set)

A set containing no elements is called Empty set.
This set is also known as void set, null set. It is denoted by {   } OR $\emptyset$

2. Singleton set

A set having only one element is called Singleton set.

3. Finite Set

Set in which the number of elements is finite or countable is called Finite set.

4. Infinite Set

Set in which the number of elements is infinite or uncountable is called as Infinite Set.

5. Equal Set

Two sets are said to be equal if and only if they contains same elements $A \subset B$, $B \subset A$ then two sets of A & B are Equal set.

6. Equivalent sets

Two sets are said to be equivalent set if and only if they contains same number of elements.
For two finite set A & B if n (A) = n (B) then A and B are known as Equivalent sets.

7. Subset And Super set

If every element of a set A is an element of set B then set A is a subset of B then the set B is known as Super set of A.
It is denoted by $A \subseteq$ B. i.e. A is subset of B.
$B \supseteq$ A ie. B is super set of A.

8. Proper Subset

If A is a subset of B but A is not equal to B then A is called a Proper subset of B.

If number of elements 'A' is less than that of 'B" then A is Proper-sub set of B.

For Proper Subset B contains at least one extra element.

It is denoted by $A \subset B$.

9. Universal Set

A set which contains all sets under consideration as sub-set, is called Universal Set.

It is denoted by U.

10. Power Set

A set whose elements are all the subset of a set 'A' is called the Power Set of 'A'.

Denoted as P (A) If n (A) = m, n (p (A)) = m.

Important Notes

1. The number of elements is a set A is called Cardinal number.
2. A – B consist of all elements of A which are not in B. $A - B = A \cap B'$.
3. B – A consist of all elements of B which are not in A. $B - A = B \cap A'$.
4. Every set is subset of itself.
5. Null set is subset of every set.
6. Universal set is superset of all sets
7. Number of Subsets are given by 2^n , which n is number of elements of set.
8. No. of proper subsets of a set of n elements is $2^n - 1$.
9. De-morgan's Law
   $(A \cup B)' = (A' \cap B')$
   $(A \cap B)' = (A' \cup B')$
10. The symmetric difference of two set A and B denoted by $A \triangle B$, Which is defined as
    $A \triangle B = (A - B) \cup (B - A)$.

Venn Diagram

Venn diagram is diagrammatic representation of sets.

Venn diagrams are generally denoted by rectangle, circle, triangle etc.

Part -I
Sets
Set - A

1. The null set is represented by
    a) { Φ}   b) { 0 }
    c) Φ   d) none of these

2. The set of cubes of the natural number is
    a) a finite set   b) an infinite set
    c) a null set   d) none of these

3. The set $\{2^x \mid x$ is any positive rational number$\}$ is
    a) an infinite set   b) a null set
    c) a finite set   d) none of these

4. The set of cubes of natural numbers is
                                     (Scanner)
    a) Null set
    b) Finite set
    c) Infinite set
    d) A finite set of three numbers

5. $\{1 – (-1)^x\}$ for all integral x is the set
    a) {0}   b) {2}
    c) {0, 2}   d) none of these

6. The set $\{x \mid 0< x < 5\}$ represents the set when x may take integral values only
    a) {0, 1, 2, 3, 4, 5}   b) {1, 2, 3, 4}
    c) {1, 2, 3, 4, 5}   d) none of these

7. If A = {1, 2, 3, 5, 7}, and B = $\{x^2 : x \in A\}$
    a) n(b) = n(A)   b) n(B) > n(A)
    c) n(A) = n(B)   d) n(B) < n(B)

8. The set {0, 2, 4, 6, 8, 10} can be written as
    a) $\{2x \mid 0 < x < 5\}$ b) $\{x : 0 < x < 5\}$
    c) $\{2x : 0 \le x \le 5\}$ d) none of these

9. The number of subsets of a set containing n elements is
    a) 2^n b) 2^{-n}
    c) n   d) none of these

10. The number of subsets of the set {2, 3, 5} is
    a) 3   b) 8
    c) 6   d) none of these

11. Let A = {a, b}. Set of subsets of A is called power set of A denoted by P(A). Now n(P(A) is
    a) 2   b) 4
    c) 3   d) none of these

12. The no. of subsets of the set {3, 4, 5} is:
                                     (Scanner)
    a) 4   b) 8
    c) 16   d) 32

13. The number of subsets of the set formed by the word Allahabad is: *(Scanner)*
    a) 128   b) 16
    c) 32   d) 64

14. The numbers of proper sub set of the set {3,4,5,6,7} is: *(Scanner)*
    a) 32   b) 31
    c) 30   d) 25

15. $\{n(n+1)/2 : n$ is a positive integer$\}$ is
    a) a finite set   b) an infinite set
    c) is an empty set   d) none of these

Using Q.16 to Q.19 If P = {1, 2, 3, 5, 7}, Q = {1, 3, 6, 10, 15},
Universal Set S = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}

16. The cardinal number of P $\bigcap$ Q is
    a) 3   b) 2
    c) 0   d) none of these

17. The cardinal number of P $\bigcup$ Q is
    a) 10   b) 9
    c) 8   d) none of these

18. n (P$^{'}$) is
    a) 10   b) 5
    c) 6   d) none of these

19. n(Q$^{'}$) is
    a) 4   b) 10
    c) 6   d) none of these

20. E is a set of positive even number and O is a set of positive odd numbers, then E U O is a
a) set of whole numbers
b) N
c) a set of rational number
d) none of these

21. A = {2, 3, 5, 7}, B { 4, 6, 8, 10} then A ∩ B can be written as
a) { }   b) { Φ }
c) (AUB)'   d) none of these

22. (A ∪ B)' is equal to
a) (A ∩ B)'
b) A ∪ B'
c) A' ∩ B'
d) none of these

23. (A ∩ B)' is equal to
a) (A' ∪ B)'   b) A' ∪ B'
c) A' ∩ B'   d) none of these

24. If A = {a, b, c, d, e, f} B = {a, e, i, o, u} and C = {m, n, o, p, q, r, s, t, u} then A ∪ B is
a) {a, b, c, d, e, f, i, o, u}
b) {a, b, c, i, o, u}
c) {d, e, f, i, o, u}
d) None

25. As per question No.(23) A ∪ C is
a) {a, b, c, d, e, f, m, n, o, p, q, r, s, t, u}
b) {a, b, c, s, t, u}
c) {d, e, f, p, q, r}
d) None

26. As per question No. (23) B ∪ C is
a) {a, e, i, o, u, m, n, p, q, r, s, t}
b) {a, e, i, r, s, t}
c) {i, o, u, p, q, r}
d) None

27. As per question No. (23) A – B is
a) {b, c, d, f}   b) {a, e, i, o}
c) {m, n, p, q}   d) None

28. As per question No. (23) A ∩ B
a) {a, e}   b) {i, o}
c) {o, u}   d) None

29. As per question No. (23) is B ∩ C
a) {a, e}   b) {i, o}
c) {o, u}   d) None

30. As per question No. (23) is A ∪ (B – C) is
a) {a, b, c, d, e, f, i}   b) {a, b, c, d, e, f, o}
c) {a, b, c, d, e, f, u}   d) None

31. As per question No. (23) A ∪ B ∪ C is
a) {a, b, c, d, e, f, i, o, u, m, n, p, q, r, s, t}
b) {a, b, c, r, s, t}
c) {d, e, f, n, p, q}
d) None

32. As per question No. (23) A ∩ B ∩ C is
a) φ   b) {a, e}
c) {m, n}   d) None

33. If A = {3, 4, 5, 6} B = {3, 7, 9, 5} and C = {6, 8, 10, 12, 7} then A' is (given that the universal set U = {3, 4, ..., 11, 12, 13}
a) {7, 8, ...12, 13}   b) {4, 6, 8, 10, ...13}
c) {3, 4, 5, 9, 11, 13}   d) None

34. As per question No. (32) with the same order of options (a), (b), (c) and (d) the set B' is

35. As per question No. (32) with the same order of options (a), (b), (c) and (d) the set C' is

36. As per question No. (32) the set (A')' is
a) {3, 4, 5, 6}   b) {3, 7, 9, 5}
c) {8, 10, 11, 12, 13}   d) None

37. As per question No. (32) the set (B')' is
a) {3, 4, 5, 6}   b) {3, 7, 9, 5}
c) {8, 10, 11, 12, 13}   d) None

38. As per question No. (32) the set (A ∪ B)' is
a) {3, 4, 5, 6}   b) {3, 7, 9, 5}
c) {8, 10, 11, 12, 13}   d) None

39. As per question No. (32) the set (A ∩ B)' is
a) {8, 10, 11, 12, 13}
b) {4, 6, 7, ...13}
c) {3, 4, 5, 7, 8, ...13}
d) None

40. As per question No. (32) the set A′ ∪ C′ is
    a) {8, 10, 11, 12, 13}
    b) {4, 6, 7, ...13}
    c) {3, 4, 5, 7, 8, ...13}
    d) None

41. If A = {1, 2, ...9}, B = {2, 4, 6, 8} C = {1, 3, 5, 7, 9}
    D = {3, 4, 5} and E = {3, 5} what is set S if it is
    also given that S ⊂ D and S ⊄ B
    a) {3, 5}   b) {2, 4}
    c) {7, 9}   d) None

42. As per question No. (40) what is set S if it is also
    given that S ⊂ B and S ⊄ C
    a) {3, 5}   b) {2, 4}
    c) {7, 9}   d) None

43. If U = {1, 2, ...9} be the universal set A = {1, 2,
    3, 4} and B = {2, 4, 6, 8} then the A ∪ B is
    a) {1, 2, 3, 4, 6, 8}
    b) {2, 4}
    c) {5, 6, 7, 8, 9}
    d) {5, 7, 9}

44. As per question No. (42) with the same order
    of options (a) (b) (c) and (d) he set A ∩ B is

45. As per question No. (42) with the same order
    of options (a) (b) (c) and (d) the set A′ is

46. As per question No. (42) with the same order
    of options (a) (b) (c) and (d) the set (A ∪ B)′ is

47. As per question No. (42) the set (A ∩ B)′ is
    a) {1, 2, 3, 4, 6, 8}
    b) {2, 4}
    c) {5, 6, 7, 8, 9}
    d) {1, 3, 5, 6, 7, 8, 9}

48. If the universal set is X = {x:x ∈ N, 1 ≤ x ≤ 12}
    and A = {1, 9, 10}, B = {3, 4, 6, 11, 12} and C =
    {2, 5, 6} are subsets of X then set A ∪ (B ∩ C) is
    ____.
    a) {3, 4, 6, 12}
    b) {1, 6, 9, 10}
    c) {2, 5, 6, 11}
    d) None

49. As per question No. (47) the set (A ∪ B) ∩ (A
    ∪ C) is ____
    a) {3, 4, 6, 12}   b) {1, 6, 9, 10}
    c) {2, 5, 6, 11}   d) None

50. If V = {0, 1, 2, ...9}, X={0, 2, 4, 6, 8}, Y = {3, 5, 7}
    and Z = {3, 7} then
    Y ∪ Z, (V ∪ Y) ∩ X, (X ∪ Z) ∪ V are respectively:-
    a) {3, 5, 7}, {0, 2, 4, 6, 8}, {0, 1, 2, ...9}
    b) {2, 4, 6}, {0, 2, 4, 6, 8}, {0, 1, 2, ...9}
    c) {2, 4, 6}, {0, 1, 2, ...9}, {0, 2, 4, 6, 8}
    d) None

51. In question No. (49) (X ∪ Y) ∩ Z and (ϕ ∪ V) ∩
    ϕ are respectively:-
    a) {0, 2, 4, 6, 8}, ϕ
    b) {3, 7}, ϕ
    c) {3, 5, 7}, ϕ
    d) None

52. A ∪ A is equal to
    a) A   b) E
    c) ϕ   d) none of these

53. A ∩ A is equal to
    a) ϕ   b) A
    c) E   d) none of these

54. A ∪ E is equal to (E is a superset of A)
    a) A   b) E
    c) ϕ   d) none of these

55. A ∩ E is equal to (E is a superset of A)
    a) A   b) E
    c) ϕ   d) none of these

56. E ∪ E is equal to (E is a superset of A)
    a) E   b) ϕ
    c) 2E   d) none of these

57. A ∩ E′ is equal to (E is a universal set)
    a) E   b) ϕ
    c) A   d) none of these

58. A ∩ ϕ is equal to (E is a superset of A)
    a) E   b) E
    c) ϕ   d) none of these

59. A U A′ is equal to (E is a universal set)
     a) E   b) ϕ
     c) A   d) none of these

60. If A = {p, q, r, s}   *(Scanner)*
         B = {q, s, t}
         C = {m, q, n}
     Find C − (A $\wedge$ B)
     a) {m, n}   b) {p, q}
     c) {r, s}   d) {p, r}

61. If A = {x : x^2 − 3x + 2 = 0},   *(Scanner)*
         B = {x : x^2 + 4x − 12 = 0}, then
         B − A is Equal to
     a) {-6}   b) {1}
     c) {1,2}   d) {2, -6}

62. For any two sets A and B the set (AUB′)′ is Equal
     to (where′ denotes compliment of the set)
                                  (Scanner)
     a) B − A   b) A − B
     c) A′ − B′   d) B′ − A′

63. If the universal set E = {x | x is a positive integer
     <25}, A = {2, 6, 8, 14, 22}, B = {4, 8, 10, 14} then
     a) (A $\bigcap$ B)′ = A′ $\bigcup$ B′
     b) (A $\bigcap$ B)′ = A′ $\bigcap$ B′
     c) (A′ $\bigcap$ B)′ = ϕ
     d) none of these

64. If A $\subset$ B, then which one of the following is true
                                  (Scanner)
     a) A ∩ B = B   b) A ∪ B = B
     c) A∩ B = A^1 d) A∩ B = φ

65. If set $A = \left\{ x : \dfrac{x}{2} \in z, \ 0 \le x \le 10 \right\}$. *(Scanner)*

     B = {x : x is one digit prime number}
     and $C = \left\{ x : \dfrac{x}{3} \in N, \ x \le 12 \right\}$

     then A ∩ (B ∩ C) is equal to −
     a) φ b)   Set A
     c) Set B   d)   Set C

66. If   A = {1, 2, 3, 4, 5, 6, 7, 8, 9}   *(Scanner)*
          B = {1, 3, 4, 5, 7, 8}; C = {2, 6, 8} then find
          (A − B) ∪ C
     a) {2, 6}   b) {2, 6, 8}
     c) {2, 6, 8, 9}   d) None

Set - B

1.   If E = {1, 2, 3, 4, 5, 6, 7, 8, 9}, the subset of E
     satisfying 5 + x > 10 is
     a) {5, 6, 7, 8, 9}   b) {6, 7, 8, 9}
     c) {7, 8, 9}   d) none of these

2.   If A Δ B = (A-B) $\bigcup$ (B-A) and A = {1, 2, 3, 4}, B
     = {3, 5, 7} then A Δ B is
     a) {1, 2, 4, 5, 7}   b) {3}
     c) {1, 2, 3, 4, 5, 7}   d) none of these

     [Hint : If A and B are any two sets, then
     A − B = {x : x ∈ A, x ∉ B}.

3.   For any two sets A and B, A ∩ (A′∪ B) = ____,
     where A′ represent the compliment of the set
     A   *(Scanner)*
     a) A ∩ B   b) A ∪ B
     c) A′ ∪ B   d) None of these

4.   If A = {1, 2, 3, 4} B = {2, 3, 7, 9} and C = {1, 4, 7,
     9} then
     a) A ∩ B ≠ ϕ, B ∩ C ≠ ϕ, A ∩ C ≠ ϕ, but A ∩ B ∩
     C = ϕ
     b) A ∩ B = ϕ, B ∩ C = ϕ, A ∩ C = ϕ, A ∩ B ∩ C
     = ϕ
     c) A ∩ B ≠ ϕ, B ∩ C ≠ ϕ, A ∩ C ≠ ϕ, A ∩ B ∩ C ≠
     ϕ
     d) None

5.   The sets V = {x / x + 2 = 0}, R = {x / x^2 + 2x =
     0} and S = {x : x^2 + x − 2 = 0} are equal to one
     another if x is equal to
     a) -2   b) 2
     c) ½   d) none of these

6.   If V = {x:x + 2 ≤ 0} R = {x:x^2 + x-2=0, x < 0} and
     S = {x:x^2+4x+4=0} then V, R, S are equal for the
     value of x equal to ____.
     a) 0   b) -1
     c) -2   d) None

7.   If R is the set of positive rational number and E
     is the set of real numbers then
     a) R $\subseteq$ E   b) R $\subset$ E
     c) E $\subset$ R   d) none of these

8. If N is the set of natural numbers and I is the set of positive integers, then
    a) N = I
    b) N ⊂ I
    c) N ⊆ I
    d) none of these

9. If I is the set of isosceles triangles and E is the set of equilateral triangles, then
    a) I ⊂ E
    b) E ⊂ I
    c) E = I
    d) none of these

10. If R is the set of isosceles right angled triangles and I is set of isosceles triangles, then
    a) R = I
    b) R ⊃ I
    c) R ⊂ I
    d) none of these

11. If A = {a, b, c, d} list the element of power set P (a)
    a) ϕ, {a}, {b}, {c}, {d}, {a, b}, {a, c}, {a, d}, {b, c}, {b, d} {c, d}
    b) {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}
    c) {a, b, c, d}
    d) All the above elements are in P (a)

12. Following set notations represent: A ⊂ B; $x \notin A$; A ⊃ B; {0}; A ⊄ B
    a) A is a proper subset of B; x is not an element of A; A contains B; singleton with an only element zero; A is not contained in B.
    b) A is a proper subset of B; x is an element of A; A contains B; singleton with an only element zero; A is contained in B.
    c) A is a proper subset of B; x is not an element of A; A does not contains B; contains elements other than zero; A is not contained in B.
    d) None

13. Represent the following sets in set notation:- Set of all alphabets in English language, set off all odd integers less than 25, set of all odd integers, set of positive integers x satisfying the equation $x^2 + 5x + 7 = 0$:
    a) A = {x : x is an alphabet in English}, I ={x : x is an odd integer>25}, I = {2, 4, 6, 8...} I = { }
    b) A = {x : x is an alphabet in English}, I ={x : x is an odd integer<25}, I = {1, 3, 5, 7...} I = { }
    c) A = {x : x is an alphabet in English}, I ={x : x is an odd integer £ 25}, I = {1, 3, 5, 7...} I = {x: x^2 + 5x + 7 = 0}
    d) None

14. Rewrite the following sets in a set builder form: - A={a, e, I, o, u} B={1, 2, 3, 4....} C is a set of integers between – 15 and 15.
    a) A = {x:x is a consonant}, B = {x:x is an irrational number}, C = {x:-15 < x < 15 ∧ x is a fraction}
    b) A = {x:x is a vowel}, B = {x:x is a natural number}, C = {x: $-15^3x^315 \wedge x$ is a whole number}
    c) A = {x:x is a vowel}, B = {x:x is a natural number}, C = {x: -15 < x < 15, x is a Integer}
    d) None

15. What is the relationship between the following sets?
    A = {x:x is a letter in the word *flower*}
    B = {x:x is a letter in the word *flow*}
    C = {x:x is a letter in the word *wolf*}
    D = {x:x is a letter in the word *follow*}
    a) B=C=D and all these are subsets of the set A
    b) B=C≠D
    c) B≠C≠D
    d) None

16. Comment on the correctness or otherwise of the following statements: - (i) {a, b, c} = {c, b, a} (ii) {a, c, a, d, c, d} ⊆ {a, c, d} (iii) {b} ∈ {{b}} (iv) {b} ⊂ {{b}} and ϕ ⊂ {{b}}.
    a) Only (iv) is incorrect
    b) (i) (ii) are incorrect
    c) (ii) (iii) are incorrect
    d) All are incorrect

17. If A = {a, b, c}, B = {a, b}, C = {a, b, d}, D = {c, d} and E = {d} state which of the following statements are correct : - (i) B ⊂ A (ii) D ≠ C (iii) C ⊃ E (iv) D ⊂ E (v) D ⊂ B (vi) D = A (vii) B ⊄ C (viii) E ⊂ A (ix) E ⊄ B (x) a ∈ A (xi) a ⊂ C (xii) {a} ∈ A (xiii) {a} ⊂ A
    a) (i) (ii) (iii) (ix) (x) (xiii) only are correct
    b) (ii) (iii) (iv) (x) (xii) (xiii) only are correct
    c) (i) (ii) (iv) (ix) (xiii) only are correct
    d) None

18. Let A = {0}, B = {0, 1}, C = ϕ D = {ϕ}, E = {x|x is a human being 300 years old}, F = {x | x ∈ A and x ∈ B} state which of the following statements are true: - (i) A ⊂ B (ii) B = F (iii) C ⊂ D (iv) C = E (v) A = F (vi) F = 1 and (vii) E = C = D

a) (i) (iii) (iv) and (v) only are true
b) (i) (ii) (iii) and (iv) are true
c) (i) (ii) (iii) and (vi) only are true
d) None

19. If A = {0, 1} state which of the following statements are true: - (i) {1} $\subset$ A (ii) {1} $\in$ A (iii) $\phi \in$ A (iv) 0 $\in$ A (v) 1 $\subset$ A (vi) {0} $\in$ A (vii) $\phi \subset$ A
a) (i) (iv) and (vii) only are true
b) (i) (iv) and (vi) only are true
c) (ii) (iii) and (vi) only are true
d) None

20. State whether the following sets are finite, infinite or empty: - (i) X = {1, 2, 3, ...500}
(ii) Y = {y: y = a^2 ; a is an integer}
(iii) A = {x:x is a positive integer multiple of 2}
(iv) B = {x:x is an integer which is a perfect root of 26<x<35}
a) finite, infinite, infinite, empty
b) infinite, infinite, finite, empty
c) infinite, finite, infinite, empty
d) None

21. If four members a, b, c, d of a decision making body are in a meeting to pass a resolution where rule of majority prevails list the wining coalitions. Given that a, b, c, d own 50%, 20%, 15%, 15% shares each.
a) {a, b}, {a, c}, {a, d}, {a, b, c}, {a, b, d}, {a, c, d}, {a, b, c, d}
b) {b, c, d}, {a}
c) {b, c}, {b, d}, {c, d} , {b}, {c}, {d}, ϕ
d) None

22. As per question No. (21) with same order of options (a) (b) (c) and (d) list the blocking conditions.

23. As per question No. (21) with same order of options (a) (b) (c) and (d) list the losing conditions.

24. If A has 32 elements, B has 42 elements and A U B has 62 elements, the number of elements in A $\cap$ B is
a) 12   b) 74
c) 10   d) none of these

25. A town has a total population of 50,000. Out of it 28,000 read the newspaper X and 23,000 read Y while 4,000 read both the papers. The number of persons not reading X and Y both is
a) 2,000   b) 3,000
c) 2,500   d) none of these

26. Out of 20 members in a family, 11 like to take tea and 14 like coffee. Assume that each one likes at least one of the two drinks. Find how many like both coffee and tea: *(Scanner)*
a) 2   b) 3   c) 4   d) 5

27. In a group of 70 people, 45 speak Hindi, 33 speak English and 10 speak neither Hindi nor English. Find how many can speak both English as well as Hindi: *(Scanner)*
a) 13   b) 19
c) 18   d) 28

28. There are 40 students, 30 of them passed in English, 25 of them passed in Maths and 15 of them passed in both. Assuming that every Student has passed at least in one subject. How many students' passed in English only but not in Maths.   *(Scanner)*
a) 15   b) 20
c) 10   d) 25

29. In a class of 50 students, 35 opted for Mathematics and 37 opted for Commerce. The number of such students who opted for both Mathematics and Commerce are:
(*Scanner*)
a) 13   b) 15
c) 22   d) 28

30. In a class of 80 students, 35% students can play only cricket, 45% students can play only table tennis and the remaining students can play both the games. In all how many students can play cricket?   *(Scanner)*
a) 55   b) 44
c) 36   d) 28

31. In a group of students 80 can speak Hindi, 60 can speak English and 40 can speak English and Hindi both, then number of students is: *(Scanner)*
    a) 100   b) 140
    c) 180   d) 60

32. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also each student likes to play at least one of the two games. How many students like to play both cricket and football? *(Scanner)*
    a) 5   b) 11
    c) 19   d) 8

33. In a group of 20 children, 8 drink tea but not coffee and 13 like tea. The number of children drinking coffee but not tea is
    a) 6   b) 7
    c) 1   d) none of these

34. Let ∪ be the universal set, A and B are the subsets of ∪. If n(∪) = 650, n (A) = 310, n(A ∩ B) = 95 and n (B) = 190, then n($\bar{A}$ ∩ $\bar{B}$) is equal to ($\bar{A}$ and $\bar{B}$ are the complement of A and B, respectively).
    a) 400   b) 200
    c) 300   d) 245

35. At a certain conference of 100 people there are 29 Indian women and 23 Indian men. Out of these Indian people 4 are doctors and 24 are either men or doctors. There are no foreign doctors. The number of women doctors attending the conference is
    a) 2   b) 4
    c) 1   d) none of these

Set - C

1. In a survey of 300 companies, the number of ompanies using different meadia – Newspapers N), Radio (R) and Television (T) are as follows:
   n(N) = 200, n(R) = 100, n(T) = 40 n (N ∩ R) = 50, n(R ∩ T) = 20, n(N ∩ T) = 25 and n(N ∩ R ∩ T) = 5. Find the numbers of companies using none of these media: *(Scanner)*
   a) 20 companies   b) 250 companies

c) 30 companies   d) 50 companies

2. Out of total 150 students 45 passed in Accounts 50 in Maths. 30 in Costing 30 in both Accounts and Maths. 32 in both Maths and Costing 35 in both Accounts and Costing. 25 students passed in all the three subjects. Find the number who passed at least in any one of the subjects.
   a) 63   b) 53
   c) 73   d) None

3. Of the 200 candidates who were interviewed for a position at call centre, 100 had a two-wheeler, 70 had a credit card and 140 had a mobile phone, 40 of them had both a two-wheeler and a credit card, 30 had both a credit card and a mobile phone, 60 had both a two-wheeler and a mobile phone, and 10 had all three. How many candidates had none of the three? *(Scanner)*
   a) 0   b) 20
   c) 10   d) 18

4. After qualifying out of 400 professionals, 112 joined industry, 120 started practice and 160 joined as paid assistants. There were 32, who were in both practice and service 40 in both practice and assistantship and 20 in both industry and assistantship. There were 12 who did all the three. Find how many could not get any of these.
   a) 88   b) 244   c) 122   d) None

5. As per question No. (4) with the same order of options (a) (b) (c) and (d) find how many of them did only one of these.

6. On a survey of 100 boys it was found that 50 used white shirt 40 red and 30 blue. 20 were habituated in using both white and red shirts 15 both red and blue shirts and 10 blue and white shirts. Find the number of boys using all the colours.
   a) 20   b) 25
   c) 30   d) None

7. A survey of 1000 customers revealed the following in respect of their buying habits of different grades:

A grade only	180
A and c grades	80
C grade	480
A grade but not B grade	230
A grade	360
C and B grades	80
None	140

How many buy B grade?
a) 280   b) 400
c) 50   d) None

8. As per question No. (7) with the same order of options (a) (b) (c) and (d) how many buy C grade if and only if they do not buy B grade?

9. As per question No. (7) with the same order of options (a) (b) (c) and (d) how many buy C and B grades but not the A grade?

10. Out 2000 staff 48% preferred coffee 54% tea and 64% cocoa. Of the total 28% used coffee and tea 32% tea and cocoa and 30% coffee and cocoa. Only 6% did none of these. Find the number having all the three.
a) 360   b) 280
c) 160   d) None

11. As per question No.(10) with the same order of options (a), (b), (c) and (d) find the number having tea and cocoa but not coffee.

12. As per question No.(10) with the same order of options (a), (b), (c) and (d) find the number having only coffee.

13. In a town of 20,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy and C and 4% buy A and C. If 2% families buy all the three newspapers, then the number of families which buy A only is:
(Scanner)
a) 6600   b) 6300
c) 5600   d) 600

14. For a group of 200 persons, 100 are interested in music, 70 in photography and 40 in swimming, Further more 40 are interested in both music and photography, 30 in both music and swimming, 20 in photography and swimming and 10 in all the three. How many are interested in photography but not in music and swimming?   *(Scanner)*
a) 30   b) 15   c) 25   d) 20

15. Complaints about works canteen had been about Mess (M) Food (F) and Service (S). Total complaints 173 were received as follows:-
$n(M) = 110$, $n(F) = 55$, $n(S) = 67$, $n(M \cap F \cap S')$ $= 20$, $n(M \cap S \cap F') = 11$ and $n(F \cap S \cap M') =$ 16. Determine the complaints about all the three.
a) 6   b) 53
c) 35   d) None

16. As per question No. (15) with the same order of options(a), (b), (c) and (d) determine the complaints about two or more than two.

17. Out of 60 students 25 failed in paper (1), 24 in paper (2), 32 in paper (3), 9 in paper (1) alone, 6 in paper (2) alone, 5 in papers (2) and (3) alone and 3 in papers (1) and (2) alone. Find how many failed in all the three papers.
a) 10   b) 60
c) 50   d) None

18. As per question No. (17) how many passed in all the three papers?
a) 10   b) 60   c) 50   d) None

19. Out of 1000 students 658 failed in the aggregate, 166 in the aggregate and in group-I 434 in aggregate and in group-II, 372 in group-I, 590 in group-II and 126 in both the groups. Find out how many failed in all the three.
a) 106   b) 224   c) 206   d) 464

20. As per question No.(19) how many failed in the aggregate but not in group-II?
a) 106   b) 224   c) 206   d) 464

21. As per question No.(19) how many failed in group-I but not in the aggregate?
    a) 106   b) 224   c) 206   d) 464

22. As per question No.(19) how many failed in group-II but not in group-I?
    a) 106   b) 224   c) 206   d) 464

23. As per question No.(19) how many failed in aggregate or group-II but not in group-I?
    a) 206   b) 464   c) 628   d) 164

24. As per question No.(19) how many failed in aggregate but not in group-I and group-II?
    a) 206   b) 464   c) 628   d) 164

25. Out of group of 20 teachers in a school, 10 teach Mathematics, 9 teach Physics and 7 teach Chemistry, 4 teach Mathematics and Physics but none teach both Mathematics and Chemistry. a) How many teach Chemistry and Physics b) how many teach only Physics?
    a) 2, 3   b) 3, 2   c) 4, 6   d) 6, 4

26. The number of items in the set A is 40, in the Set B is 32, in the Set C is 50, in both A and B is 4, in both A and C is 5; in both B and C is 7, in all the set is 2. How many are in only one set?
    a) 65   b) 110   c) 96   d) 84

27. A marketing research team interviews 50 people about their drinking habits of tea coffee or milk or ABC respectively. Following data is obtained but the Manager is not sure whether these are consistent.

Category	No.	Category	No.
ABC	3	A	42
AB	7	B	17
BC	13	C	27
AC	18		

    a) Inconsistent since 42 + 17 + 27 – 7 -13 – 18 + 3 ≠ 50
    b) Consistent
    c) Cannot determine due to data insufficiency
    d) None

28. In a market survey you have obtained the following data which you like to examine regarding its correctness:

Did not use the brand	Percentage answering 'Yes'
April	59
May	62
June	62
April & May	35
May & June	33
April & June	31
April May June	22

a) Inconsistent since 59 + 62 + 62 – 35 – 33 – 31 + 22 ≠ 100
b) Consistent
c) Cannot determine due to data insufficiency
d) None

29. In his report an Inspector of an assembly line showed in respect of 100 units the following which you are require to examine.

Defect	No. of pieces
Strength (S)	35
Flexibility (F)	40
Radius (R)	18
S and F	7
S and R	11
F and R	12
S F R	3

a) No. of pieces with radius defect alone was - 2 which was impossible
b) Report may be accepted
c) Cannot be determined due to data insufficiency
d) None

30. As per question No.(6) if 10 boys did not use any of the white red or blue colours and 20 boys used all the colours offer your comments.
    a) Inconsistent since 50 + 40 + 30 – 20 – 15 – 10 + 20 ≠ 90
    b) Consistent
    c) Cannot determine due to data insufficiency
    d) None

31. A sample of income group of 1172 families was surveyed and noticed that for income groups < Rs.6000/-, 6000/- to Rs.10999/-, Rs.11000/-, to Rs.15999/- Rs.16000 and above, no TV set is available to 70, 50, 20, 50 families one set is available to 152, 308, 114, 46 families and two

or more sets are available to 10, 174, 84, 94 families.

If A = {x|x is a family owning two or more sets}, B = {x|x is a family with one set,} C = {x|x is a family with income less than Rs.6000/-}, D = {x|x| is a family with income Rs.6000/- to Rs.10999/-}, E = {x|x is a family with income Rs.11000/- to Rs.15999/-}, find the number of families in each of the following sets (i) C ∩ B (i) A ∪ E

a) 152, 580   b) 152, 20
c) 152, 50   d) 152, 496

32. As per question No. (31) find the number of families in each of the following sets:-
(i) (A ∪ B)' ∩ E (ii) (C ∪ D ∪ E) ∩ (A ∪ B)'
a) 20, 50   b) 152, 20
c) 152,50   d) 20, 140

33. As per question No. (31) express the following sets in set notation:-
i) {x|x is a family with one set and income of less than Rs.11000/-}
ii) {x|x is a family with no set and income over Rs.16000/-}
a) (C ∪ D) ∩ B   b) (A ∪ B)' ∩ (C' ∩ D' ∩ E')
c) Both   d) None

34. As per question No. (31) (express the following sets in set notation:-
i) {x|x is a family with two or more sets or income of Rs.11000/- to Rs.15999/-}
ii) {x|x is a family with no set}
a) (A ∪ E)   b) (A ∪ B)'
c) Both   d) None

35. Consider the following data:-

	Skilled & Direct Worker	Unskilled & Direct Worker	Skilled & Indirect Worker	Unskilled & Indirect Worker
Short Term	6	8	10	20
Medium Term	7	10	16	9
Long Term	3	2	8	0

If S M L T I denote short medium long terms skilled and indirect workers respectively find the number of workers in set M.
a) 42   b) 8   c) 10   d) 43

36. Consider the problem No. (35) and find the number of workers in set L ∩ I.
a) 42   b) 8   c) 10   d) 43

37. Consider the problem No. (35) and find the number of workers in set S ∩ T ∩ I.
a) 42   b) 8   c) 10   d) 43

38. Consider the problem No. (35) and find the number of workers in set (M ∪ L) ∩ (T ∪ I).
a) 42   b) 8   c) 10   d) 43

39. Consider the problem No. (35) and find the number of workers in set S' ∪ (S' ∩ I)'.
a) 42   b) 44   c) 43   d) 99

40. Consider the problem No. (35). Find out which set of the pair has more workers as its members. Pair is (S ∪ M)' or L: -
a) (S ∪ M)' > L   b) (S ∪ M)' < L
c) (S ∪ M)' = L   d) None

41. Consider the problem No. (35). Find out which set of the pair has more workers as its members. Pair is (I ∩ T)' or S – (I ∩ S'): -
a) (I ∩ T)' > [S – (I ∩ S')]
b) (I ∩ T)' < [S – (I ∩ S')]
c) (I ∩ T)' = [S – (I ∩ S')]
d) None

Relations

A. Relation : Let A and B be two sets, then a relation R from A to B is a subset of A x B. A relation R consists of the following:

- Two sets say A and B
- An open sentence P(x, y) in which P(a, b) is either true or false for any ordered pair {a, b} ∈ A x B, then R is called a relation from A to B and is denoted by R = {A, B, P (x, y)}.

B. Types of Relations :

1. **Equivalence Relation :** Let S = {a, b, c, d, ...} be any set then the relation R is a subset of the product set SxS. A relation R on a set S is said to be an equivalence relation on S if it is –

   (a) Reflexive : A relation on a set S is said to be reflexive if every element of S is related to itself. Thus, R is reflexive if R contains all ordered pairs of the form (a, a) in S x S.

   (b) Symmetric : A relation R on set S is said to be symmetric if (a, b) (a, b) ∈ R ⇒ (b, a) ∈ R for all a, b ∈ R.

   (c) Transitive: A relation R on set S is said to be transitive relation if (a, b) ∈ R and (b, c) ∈ R. (a, c) ∈ R for a, b, c ∈ R. [Refer Illustration 7]

2. **Universal Relation :** Relation A x A ⊆ A x A is called the universal relation on A.

3. **Identity Relation :** I_A = {(a, a) : a ∈ A} on set A is called the identity relation on A. Example: Let A = {1, 2, 3} then I = {(1, 1), (2, 2), (3, 3)}

4. **Inverse Relation :** If R be a relation on A, then the relation R-1 on A, defined by R-1 = {(b, a) : (a, b) ∈ R} is called as inverse Relation on A.

C. Domain and Range of a Relation : If R is a relation from A to B. Then the set of all first co-ordinates of elements of R is called the domain of R, while the set of all second co-ordinates of elements of R is called the range of R.

Ex : Relation R = {(1, 3) (2, 5) (7, 9)}. Domain (R) = {1, 2, 7} Range (R)= {3, 5, 9}.

Part -II
Relations
Set - A

1. If the set P has 3 elements, Q four and R two then the sep P × Q × R contains
    a) 9 elements   b) 20 elements
    c) 24 elements   d) none of these

2. Let P = {1, 2, x}, Q = {a, x, y}, R = {x, y, z} then P × Q is
    a) {(1, a), (1, x), (1, y), (2, a), (2, x), (2, y), (x, a), (x, x), (x, y)}
    b) {(1, x), (1, y), (1, z), (2, x), (2, y), (2, z), (x, x), (x, y), (x, z)}
    c) {(a, x), (a, y), (a, z), (x, x), (x, y), (x, z), (y, x), (y, y), (y, z)}
    d) {(1, x), (1, y), (2, x), (2, y), (x, x), (x, y)}

3. As per question No.(3) with the same order of options (a) (b) (c) and (d) then the set P × R is

4. As per question No.(3) with the same order of options (a) (b) (c) and (d) then the set Q × R is

5. As per question No.(3) with the same order of options (a) (b) (c) and (d) then the set (P × Q) ∩ (P × R) is

6. As per question No.(3) the set (R × Q) ∩ (R × P) is
    a) {(a, x), (a, y), (a, z), (x, x), (x, y), (x, z), (y, x), (y, y), (y, z)}
    b) {(1, x), (1, y), (2, x), (2, y), (x, x), (x, y)}
    c) {(x, x), (y, x), (z, x)}
    d) {(1, a) (1, x), (1, y), (2, a), (2, x), (2, y), (x, a), (x, x) (x, y), (x, 1), (x, 2), (y, 1), (y, 2), (y, x), (z, 1), (z, 2), (z, x)}

7. As per question No. (3) with the same order of options (a) (b) (c) and (d) as in question No.(7) the set (P × Q) ∪ (R × P)

8. Identify the elements of P if set Q = {1, 2, 3} and P × Q = {(4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (6, 1), (6, 2), (6, 3)}
    a) {3, 4, 5}   b) {4, 5, 6}
    c) {5, 6, 7}   d) None

9. If A = {2, 3}, B = {4, 5}, C = {5, 6} then A × (B ∪ C) is
    a) {(2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6)}
    b) {(2, 5, (3, 5)}
    c) {(2, 4), (2, 5), (3, 4), (3, 5), (4, 5), (4, 6), (5, 5), (5, 6)}
    d) None of these

10. As per question No.(10) with the same order of options (a) (b) (c) and (d) the set A × (B ∩ C) is

11. As per question No. (10) with the same order of options (a) (b) (c) and (d) the set (A × B) ∪ (B × C) is

12. If A = {2,3}, B = {4,5}, C = {5, 6}, then A × (B∩C) = ___.   *(Scanner)*
    a) {(5,2), (5,3)}   b) {(2,5), (3,5)}
    c) {(2,4), (3,5)}   d) {(3,5), (2,6)}

13. If A = {1, 2, 3, 4, 5}, B = {2, 4} and C = {1, 3, 5} then (A – C) × B is   *(Scanner)*
    a) {(2, 2), (2, 4), (4, 2), (4, 4), (5, 2), (5, 4)}
    b) {(1, 2), (1, 4), (3, 2), (3, 4), (5, 2), (5, 4)}
    c) {(2, 2), (4, 2), (4, 4), (4, 5)}
    d) {(2, 2), (2, 4), (4, 2), (4, 4)}

14. The domain of {(1, 7), (2, 6)} is
    a) {1, 6}   b) {6, 7}
    c) {1, 2}   d) None of these

15. The range of {(3, 0), (2, 0), (1, 0), (0, 0)} is
    a) {0, 0}   b) {0}
    c) {0, 0, 0, 0}   d) none of these

16. The range of {(1,0), (2,0), (3,0), (4,0), (0,0)} is
    a) {1,2,3,4,0}   b) {0}   *(Scanner)*
    c) {1,2,3,4,}   d) None of these

17. If A = {1,2} and B = {3,4}. Determine the number of relations from A and B: *(Scanner)*
    a) 3   b) 16   c) 5   d) 6

Set - B

By using R = Reflexive; T = Transitive, S = Symmetric and E = Equivalence from Q. No. 1 to

1. "Is equal to" over the set of all rational numbers is
   a) T   b) S
   c) R   d) E

2. {(x, y) / $x \in \times$, $y \in y$, y = x} is
   a) R   b) S   c) T   d) E

3. {(x,y) / x + y = 2x where x and y are positive integers}, is
   a) R   b) S   c) T   d) E

4. "Is smaller than" over the set of eggs in a box is
   a) Transitive (T)   b) Symmetric (S)
   c) Reflexive (R)   d) Equivalence (E)

5. "Is the square of" over n set of real numbers is
   a) R   b) S
   c) T   d) none of these

6. "is perpendicular to" over the set of straight lines in a given plane is
   a) R   b) S
   c) T   d) E

7. On the set of lines, being perpendicular is a ____ relation.   *(Scanner)*
   a) Reflexive
   b) Symmetric
   c) Transitive
   d) None of these

8. "is the reciprocal of" ……. Over the set of non-zero real numbers is
   a) S
   b) R
   c) T
   d) none of these

9. "has the same father as" ……. Over the set of children
   a) R   b) S
   c) T   d) E

10. In the set N of all natural numbers the relation R defined by a R b "if and only if, a divide b", then the relation R is: *(Scanner)*
    a) Partial order relation
    b) Equivalence relation
    c) Symmetric relation
    d) None of these

11. Let A = {1, 2, 3}, then the relation R = (1, 1), (2, 3), (2, 2), (3, 3), (1, 2)} is   *(Scanner)*
    a) Symmetric   b) Transitive
    c) Reflexive   d) Equivalence

12. If S = {1,2,3} then the relation {(1,1), (2,2), (1,2), (2,1)} is symmetric and   *(Scanner)*
    a) Reflexive but not transitive
    b) Reflexive as well as transitive
    c) Transitive but not reflexive
    d) Neither transitive nor reflexive

13. If a is related to b if and only if the difference in a and b is an even integer. This relation is
    a) Symmetric, reflexive but not transitive
    b) Symmetric transitive but not reflexive
    c) transitive reflexive but not symmetric
    d) equivalence relation

Functions

1. **Relation and Function :** Any subset of the product set XY is said to define a relation from X to Y and any relation from X to Y in which no two different ordered pairs have the same first element is called a function. A function is represented as f : X → Y. **Example :** f : X → Y = {(1, 2), (3, 4)} is a valid function between X and Y, whereas f : X → Y = {(4, 2), (4, -2)} is not a valid function between X and Y since a single element of X (4) is mapped to two elements in Y (2 and -2). **Note :** One more essential feature of a function is that every element of X should be mapped to Y. But the reverse not be true.

Is a Function	Not a Function	Not a Function	Is a Function
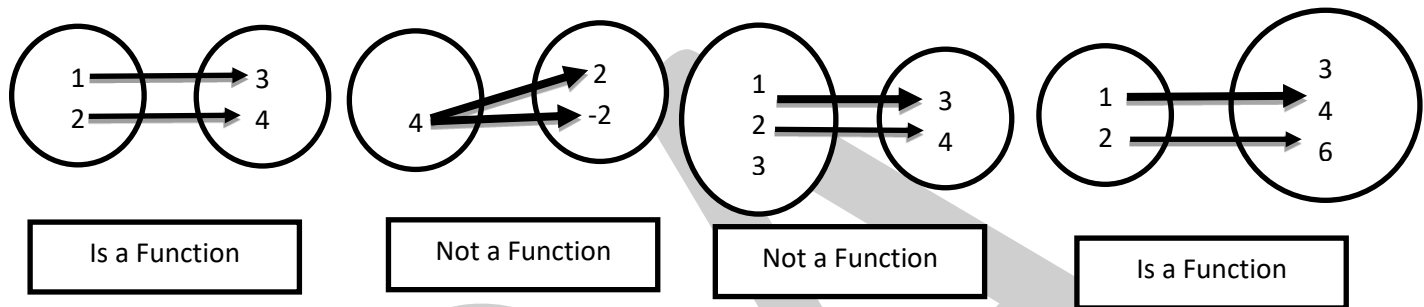
2. **Image :** The element y is called the image of x under the f and is denoted by f(x), i.e., y = f(x), and x is called the pre-image of y.

3. **Domain & Co-domain :** If A → B, A is called the Domain and set B is called the Co-Domain of f.

4. **Range :** The set of all images of the elements of A under the mapping f is called the range of f and is denoted by f(X) or R_f, where f(X) = {f(x) x ∈ X}. In general, f(X) ⊆ Y. **Example :** We consider the rule f(x) = X2. Let A = {1, 2, 3, 4...). Then f(1) = 1; f(2) = 4; f(3) = 9; f(4) = 16. Then clearly each element in a has a unique image in B. Here domain (f) = {1, 2, 3, 4} and Range (f) = {1, 4, 9, 16}.

5. Types of functions :

(a) One to One Function (Injective) : In f : A → B. If different elements in A have different images in B, then f is said to be a one -one or an Injective Function or Mapping. Example: Let A = {1, 2} and B = {2, 4, 6}. Let us consider f : A → B: f(x) = 2x. f(1) = 2; f(2) = 4; f(3) = 6. f is function from A to B such that different elements in A have different images in B and hence is one – one.

One to one Functions
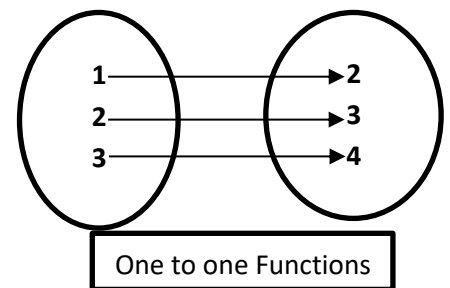
(b) **Into Function :** If in A B, there exists even a single element in B having no pre-image in A, then f is said to be an Into function. Example: Let A = {2, 3, 5, 7} and B = {0, 1, 3, 5, 7}. Let us consider f : A → B;; F (x) = x – 2. Then f(2) = 0; f(3) = 1; f(5) = 3 & f(7) = 5. It is clear that f is a function from A to B. Here there exists an element 7 In B, having no pre-image in A. So, if is an into function.
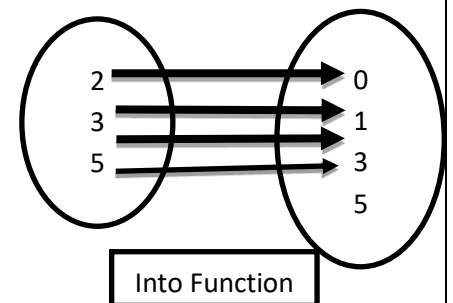
Into Function

(c) Onto Function (Surjective): A function f defined from the set X to the set
Y is said to be an onto function if every element in the co-domain is mapped
to by some element in its domain. Example : A = {1,2, 3}, B = {2, 4, 6}, the
F(x) = 2x gives, f(1) = 2, f(2) = 4, f(3) = 6 therefore F(x) is an onto function,
since all the images in B have a pre-image in A.
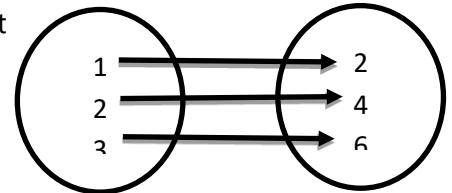
Onto Function

(d) Bijection (One- One Onto) : A mapping which is both injective and surjective
is called a bijection. In other words, a mapping f: X → Y is called one-one onto
(Bijection) if the following conditions are satisfied:

- Each element in X is mapped to a different element of Y.
- Given any element of y ∈ Y, there exists an element x ∈ X and such that y
  = f (x), i.e.. every element of Y has a pre-image.
- Example : A = {1, 2, 4}, B = {2, 4, 6}, then F(x) = 2x gives, f(1) =2, f (2) = 4, therefore
  F(x) is a one to onto function, since all the images in B have a preimage of A and all the images are
  mapped to only one image.
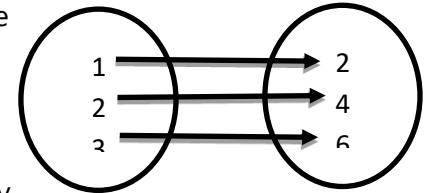
Bijective

(e) Many to one : A mapping (from the set X to the set Y is said to be many-one if
f(a) = f(b) even if a ≠ b, a, b ∈ X. f(a), f(b) = Y. In other words, if a given element
of Y may have more than one pre-image but no element of X can have more
than one f-image, then mapping is said to be many-one. Example : Let f: A → B:
be {(-2,5), (2,5), (3,6)}. The same is a many to one function since, there are two
pre-images with the same image.
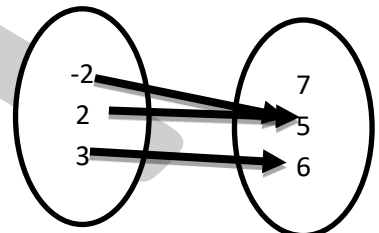
Many to One

(f) Identify Mapping : A mapping f defined from the set X to the set X is said to be
Identify mapping if every element x ∈ X is mapped to itself, i.e. in case of identity
mapping f(x) = x, ∀ x ∈ X, f(x) = X. The identify mapping is always one-one and
onto, i.e. it is always a Bijection.
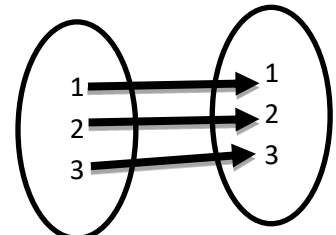
Identitiv

(g) Constant Mapping : Let f : A → B, defined in such a way that all the elements in
A have the same image in B, then f is said to be a constant function. In other words,
a function f : X → Y is constant function if the range of f is Singleton Set. Example
: Let A = {1, 2, 3} and B = {5, 7, 9}. Let f A → B : f(x) = 5 for all x ∈ A. Then, all the
elements in A have the same image namely 5 in B.
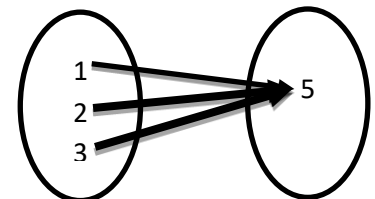
Identitv

(h) Inverse Function : Let f be a function defined from the set X to the set Y, i.e., f : X → Y and g be a function
defined from the set Y to the set X, i.e., g : Y X; then function g is said to be inverse of f if f{f(x)} = x, ∀ x ∈ X
and the function g is denoted by f-1. A function g which possesses an inverse is called invertible.

(i) Composite function : Let f : A → B and g : B → C; then the composite of the functions f and g, denoted by
gof or fg is a mapping gof : A → C such that (gof) (x) = g f(x)], ∀ x ∈ A and g[f(x)] ∈ C.

(j) Even Function : A function $y = f(x)$ is called an even function of x if $f(x) = f(-x)$ for all the values of x. **Example:** $y = x^2$ is an even function as : $(-x)^2 = x^2$.

(k) Odd function : A function $y = f(x)$ is said to be an odd function of x if $f(-x) = f(x)$ for all the values of x. **Example :** $f(x) = x^3$ is an odd function of x as : $(-x)^3 = x^3 = f(x)$.

(l) Equality of two functions: Two functions f and g are said to be equal if they are defined on the same domain X and if $f(x) = g(x)$, $\forall x \in X$.

6. Other Terms

(a) Inverse image of an element : Let f be a function defined from the set X to the set Y, then the inverse image of an element $b \in Y$ under f is denoted by $f^{-1}(b)$ to be read as f inverse b and $f^{-1}(b) = \{x \mid x \in X$ and $f(x) \in B\}$. Obviously, $f^{-1}(B)$ is a subset of X and $f^{-1}[f(x)] = X$.

(b) Inverse image of a subset : Let f be a function defined from the set X to the set Y and B be a subset of Y, i.e., $B \subseteq Y$. then the inverse of B under f is given by $f^{-1}(B) = \{x \mid x \in X$ and $f(x) \in B\}$. Obviously, f-1 (B) is a subset of x and $f^{-1}[f(X)] = X$.

Part -III
Functions
Set - A

1. If A = {x, y, z}, B = {a, b, c, d}, then which of the following relation from the set A to set B is a function? *(Scanner)*
    a) {(x, a), (x, b), (y, c), (z, d)}
    b) {(x, a), (y, b), (z, d)}
    c) {(x, c), (z, b), (z, c)}
    d) {a, z), (b, y), (c, z), (d, x)}

2. Identity the function from the following:
    (Scanner)
    a) {(1,1), (1,2), (1,3)}
    b) {(1,1), (2,1),(2,3)}
    c) {(1,2), (2,2,), (3,2),(4,2)}
    d) None of these

3. If A = {a, b, c, d}; B = {p, q, r, s} which of the following relation is a function from A to B
    (Scanner)
    a) R_1 = {(a, p), (b, q), (c, s)}
    b) R_2 = {(p, a), (b, r), (d, s)}
    c) R_3 = {(b, p), (c, s), (b, r)}
    d) R_4 = {(a, p), (b, r), (c, q), (d, s)}

4. X = {x, y, w, z}, y = {1,2,3,4}
    H = {(x,1), (y, 2), (y, 3), (z, 4), (x, 4)} *(Scanner)*
    a) H is a function from X to Y
    b) H is not a function from X to Y
    c) H is a relation from Y to X
    d) None of the above

5. Let A={1,2,3} and B={6,4,7}. Then, the relation R={(2,4), (3,6)} will be: *(Scanner)*
    a) Function from A to B
    b) Function from B to A
    c) Both A and B
    d) Not a function

6. Let the domain of x be the set {1}. Which of the following functions are equal to 1
    a) $f(x) = x^2$, $g(x) = x$
    b) $f(a) = x$, $g(x) = 1-x$
    c) $f(x) = x^2 + x + 2$, $g(x) = (x + 1)^2$
    d) none of these

7. If $f(x) = 1/1-x$, $f(-1)$ is
    a) 0   b) ½
    c) 1   d) none of these

8. If $g(x) = (x-1)/x$, $g(-½)$ is
    a) 1   b) 2
    c) 3/2   d) 3

9. If $f(x) = x^2 - 1$ and $g(x) = \frac{x+1}{2}$ then $\frac{f(3)}{f(3)+g(3)}$ is
    a) 5/4   b) 4/5
    c) 3/5   d) 5/3

10. If $f(x) = x^3 - x^2 + x + 1$ then the value of $[f(1) + f(-1)]/2$ will be
    a) 5   b) 2
    c) 0   d) -2

11. If $f(x) = |x| + |x-2|$, then redefine the function. Hence find f (3.5), f (-2), f (1.5).
    a) 5, 6, 2   b) 2, 4, 5
    c) 7, 6, 5   d) 0, 2, 5

12. If $f(x) = x+3$, $g(x) = x^2$,   then f(x).g(x) is
    a) $(x + 3)^2$
    b) $x^2 + 3$
    c) $x^3 + 3x^2$
    d) none of these

13. $\{(x, y) \mid x<y\}$ where x, y $\in$ R is
    a) not a function
    b) a function
    c) one-one mapping
    d) none of these

14. $\{(x, y), y = x^2\}$ where x, y $\in$ R is
    a) not a function
    b) a function
    c) inverse mapping
    d) none of these

15. $\{(x, y) \mid x = 4\}$ where x, y $\in$ R is a
    a) not a function
    b) function
    c) one-one mapping
    d) none of these

16. $\{(x, y) \mid x + y = 5\}$ where x, y $\in$ R is a
    a) not a function
    b) a composite function
    c) one-one mapping
    d) none of these

17. If $f(x) = \frac{x^2-25}{x-5}$, then f(5) is   *(Scanner)*
    a) 0   b) 1

c) 10   d) not defined

18. If A = {x, y, z}, B = {p, q, r, s} which of the relation on A to B are function.
    a) {(n, p), (x, q), (y, r), (z, s)},
    b) {(x, s), (y, s), (z, s)}
    c) {(y, p), (y, q), (y, r), (z, s),
    d) {(x, p), (y, r), (x, s)}

19. Which of the diagram is graph of a function
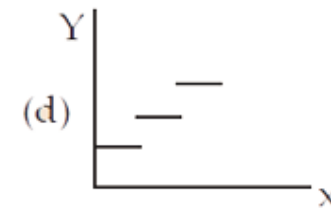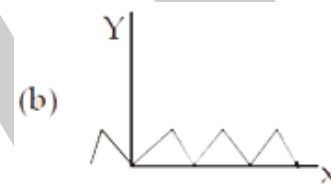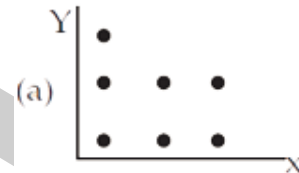
Set - B

1. The function $f(x) = 2^x$ is
    a) one-one mapping   b) one-many
    c) many-one   d) none of these

2. If A = {±2,±· 3}, B = {1, 4 9} and F = {(2, 4),   (-2, 4), (3, 9), (-3, 4)} then 'F' is defined as:
                          (Scanner)
    a) One to one function from A into B.
    b) One to one function from A onto B.
    c) Many to one function from A onto B.

d) Many to one function from A into B.

3. If N be the set of all natural numbers and E be the set of all even natural numbers then the function f: $N \rightarrow E$, such that f(x) = 2x for all $X \in N$ is   *(Scanner)*
    a) One-one onto   b) One-one into
    c) Many-one onto   d) constant

4. A is {1,2,3,4} and B is {1,4,9,16,25} if a function f is defined from set A to B where f(x) = x^2 then the range of f is: *(Scanner)*
    a) {1,2,3,4}   b) {1,4,9,16}
    c) {1,4,9,16,25}   d) None of these

5. The range of the function f : N $\rightarrow$ N ; f(x) = $(-1)^{x-1}$, is   *(Scanner)*
    a) {0, -1}   b) {1, -1}
    c) {1, 0}   d) {1, 0, -1}

6. The range of the function f(x) = $\log_{10}$ (1 + x) for the domain of real values of x when 0 ≤ x ≤ 9 is
    a) [0, 1]   b) (0, 1)
    c) [0, 2]   d) none of these

7. If F : A $\rightarrow$ R is a real valued function defined by f(x) = $\frac{1}{x}$, then A = ___.   *(Scanner)*
    a) R   b) R – {1}
    c) R – {0}   d) R – N

8. The number of elements in range of constant function is   *(Scanner)*
    a) One   b) Zero
    c) Infinite   d) Indetermined

9. f(x = 3+x, for – 3< x <0 and 3 – 2x for 0< x <3, then Value of f(2) will be   *(Scanner)*
    a) - 1   b)   1
    c) 3   d)   5

10. Let f : R $\rightarrow$ R be such that f(x) = 2^x, then f(x + y) equals: *(Scanner)*
    a) f(x) + f(y)   b) f(x). f(y)
    c) f(x) ÷ f(y)   d) None of these

11. If f(x) = x+3, g(x) = x^2, then fog(x) is
    a) x^2 + 3   b) x^2 + x + 3
    c) $(x + 3)^2$ d) none of these

12. If f(x) = x + 3, g(x) = x^2, the g of (x) is
    a) $(x + 3)^2$ b) x^2 + 3
    c) x^2 (x + 3),   d) none of these

13. Let R is the set of real numbers, such that the function f :R $\rightarrow$ R are defined by f(x) = x^2 + 3x + 1 and g(x) = 2x – 3. Find (fog) :   *(Scanner)*
    a) $4x^2$ + 6x + 1   b) x^2 + 6x + 1
    c) $4x^2$ – 6x + 1   d) x^2 – 6x + 1

14. If f(x) = x + 2, g (x) = 7^x, then g of (x) = ___   *(Scanner)*
    a) 7^x. x + 2.7^x b) 7^x + 2
    c) 49 (7^x) d) None of these

Set - C

1. If f(x) = 1/1-x and g(x) = (x-1)/x, than fog(x) is
    a) x   b) 1/x
    c) -x   d) none of these

2. If f(x) = 1/1-x and g(x) = (x-1)/x, than g of(x) is
    a) x-1   b) x
    c) 1/x   d) none of these

3. If f(x) = $\frac{x}{\sqrt{1+x^2}}$ and g(x) = $\frac{x}{\sqrt{1-x^2}}$ Find fog?   *(Scanner)*
    a) x   b) $\frac{1}{x}$
    c) $\frac{x}{\sqrt{1-x^2}}$ d) $x\sqrt{1-x^2}$

4. If f(x) = x^2 and g(x) = $\sqrt{x}$ then   *(Scanner)*
    a) go f(3) = 3   b) go f(-3) = 9
    c) go f(9) = 3   d) go f(-9) = 3

5. If f : R $\rightarrow$ R , f(x) = x + 1, G : R $\rightarrow$ R g(x) = x^2 + 1 Then fog (-2) equals to   *(Scanner)*
    a) 6   b) 5
    c) -2   d) None

6. If f(x) = 2x + 2 and g(x) = x^2, then the value of fog (4) is: *(Scanner)*
    a) 18   b) 22   c) 34   d) 128

7. If f(x) = $x^2 - 1$ and g(x) = |2x + 3|, then fog(3) − gof(−3) =   *(Scanner)*
    a) 71   b) 61   c) 41   d) 51

8.   If A = {1, 2, 3, 4,}, B = {2, 4, 6, 8,}, f (1) = 2, f(2) = 4, f (3) = 6 and f (4) = 8, And f : A → B then f⁻¹ is :   *(Scanner)*
     a) {(2,1), (4,2), (6,3), (8,4)}
     b) {(1,2), (2,4), (3,6), (4,8)}
     c) {(1, 4), (2,2), (3,6), (4, 8)}
     d) None of these

9.   A = {1 2 3 4 ....10} a relation on A, R = {(x, y) / x + y = 10, x ϵ A, Y ϵ A, x ≥ Y} then domain of R⁻¹ is   *(Scanner)*
     a) {1, 2, 3, 4, 5}   b) {0, 3, 5, 7, 9}
     c) {1, 2, 4, 5, 6, 7}   d) None

10. The Inverse function f⁻¹ of f(x) = 2x is
     a) 1/2x   b) $\frac{x}{2}$
     c) 1/x   d) none of these

11. The inverse function f⁻¹ of f(x) = 100x is:
                                                (Scanner)

     a) $\frac{x}{100}$ b) $\frac{1}{100x}$

     c) $\frac{1}{x}$ d) None of these

12. The inverse function f⁻¹ of f(y) = 3y is _____.
     a) 1/3y   b) y/3
     c) -3y   d) 1/y

13. If f R → R is a function, defined by f(x) = 10x − 7, if g(x) = f⁻¹(x), then g(x) is equal to
                                                (Scanner)

     a) $\frac{1}{10x-7}$ b) $\frac{1}{10x+7}$

     c) $\frac{x+7}{10}$ d) $\frac{x-7}{10}$

14. If f : R → R , f(x) = 2x + 7, then the inverse of f is: *(Scanner)*
     a) (x − 7)/2   b) (x + 7)/2
     c) (x − 3)/2   d) None

15. If f(x) = 1/1-x, then f⁻¹(x) is
     a) 1-x   b) (x-1)/x
     c) x/(x-1)   d) none of these

16. If $u(x) = \frac{1}{1-x}$, then $u^{-1}(x)$ is :
     a) $\frac{1}{x-1}$ b) $1 - x$

c) $1 - \frac{1}{x}$ d) $\frac{1}{x} - 1$

17. If f(x) = $\frac{2+x}{2-x}$, then f⁻¹(x) :   *(Scanner)*

     a) $\frac{2(x-1)}{x+1}$ b) $\frac{2(x+1)}{x-1}$

     c) $\frac{x+1}{x-1}$ d) $\frac{x-1}{x+1}$

18. If f(x) = log₁₀ x find f⁻¹(x)
     a) eˣ   b) 10ˣ
     c) logₓ10   d) None

19. Find f⁻¹ (3) if f(x) = 3x − 1.
     a) $\frac{1}{3}$ b) 1
     c) $\frac{4}{3}$ d) 2

20. Find f⁻¹(2) − 2f⁻¹(−1)
     a) $\frac{4}{5}$ b) -1
     c) $\frac{6}{5}$ d) 1

21. If f(x) = 2x + h then find f(x + h) − 2f (x)
                                                (Scanner)
     a) h − 2x
     b) 2x − h
     c) 2x + h
     d) None of these

22. If f (x) = x² + x-1 and 4f (x) = f (2x) then find 'x'.
                                                (Scanner)
     a) 4/3
     b) 3/2
     c)   - 3/4
     d) None of these

23. If f(x) = log $\left(\frac{1+x}{1-x}\right)$ then f $\left(\frac{2x}{1+x^2}\right)$=
     a) f(x)   b) 2 f(x)
     c) 3 f(x)   d) – f(x)

24. Find the Domain & Range if $f(x) = 2x$
     a) R, R   b) R – {0}, R
     c) R, R – {0}   d) None

25. Find the Domain & Range, if $f(x) = \frac{x-1}{2}$
     a) R – {1}, R   b) R, R
     c) R, R – {1}   d) None

26. Find the domain & Range if $f(x) = \frac{3x}{x-1}$

    a) R − {1}, R − {3}
    b) R − {1}, R − {1}
    c) R − {3}, R − {3},
    d) R − {3}, R − {1}

27. Find the domain & Range if $f(x) = \frac{4+x}{3+x}$

    a) R , R − {-3}
    b) R − {-3}, R − {2}
    c) R − {-3}, R − {1}
    d) R − {1}, R − {3}

28. Find the domain of $f(x) = \sqrt{x-3}$
    a) R   b) $(3, \infty)$
    c) $[3, \infty)$ d) $(-3, \infty)$

29. Find the domain and Range if $f(x) \sqrt{x+5}$
    a) $(-5, \infty), (-\infty, \infty)$
    b) $(-5, \infty), (0, \infty)$
    c) $[-5, \infty), (0, \infty)$
    d) $[-5, \infty], [0, \infty]$

30. Find the domain if $f(x) = \sqrt{1-x^2}$
    a) (-1, 1)   b) [-1, 1]
    c) $(1, \infty)$ d) $(-\infty, -1)$

31. Find the domain and Range if $f(x) = \sqrt{4-x^2}$
    a) [-2, 2], [-2, 2]
    b) [-2, 2], [0, 2]
    c) (-2, 2), (0, 2)
    d) None

32. The range of the function f defined by f(x) = $\sqrt{16-x^2}$
    a) [-4, 0]   b) [-4, 4]
    c) [0, 4]   d) (-4, 4)

☙☙☙☙

Chap 8 A :- Derivatives

Part - I

Direct
(Module + Scanner)
Set - A

1. If $y=x^3$ then dy/dx is
   a) $x^4/4$ b) $- x^4/4$
   c) $3x^2$ d) $- 3x^2$

2. If $y = x^{2/3}$ then dy/dx is
   a) $(2/3)x^{-1/3}$ b) $(3/5)x^{-5/3}$
   c) $(-3/5)x^{-5/3}$ d) None

3. If $y=x^{-8}$ then dy/dx is
   a) $-8x^{-9}$ b) $8x^{-9}$
   c) $-8x^9$ d) $8x^9$

4. If $y=5x^2$ then dy/dx is
   a) $10x$ b) $5x$
   c) $2x$ d) None

5. If $y=x^{-1/2}$ then dy/dx is
   a) $(-1/2)x^{-3/2}$ b) $(1/2)x^{-3/2}$
   c) $(1/2)x^{3/2}$ d) None

6. If $y=-3x^{-7/3}$ then dy/dx is
   a) $7x^{-10/3}$ b) $-7x^{-10/3}$
   c) $(-7/3)x^{-10/3}$ d) None

7. If $y = \dfrac{1}{\sqrt{x}}$ then $\dfrac{dy}{dx}$ is equal to
   a) $\dfrac{1}{2x\sqrt{x}}$
   b) $\dfrac{-1}{x\sqrt{x}}$
   c) $-\dfrac{1}{2x\sqrt{x}}$
   d) none of these

8. $y = 3x^2 + 5x - 2$ find $\dfrac{dy}{dx}$
   a) $6x + 5$ b) $6x - 5$
   c) $5 + 6x$ d) None

9. If $y=2x^2 + x$ then dy/dx is
   a) $4x + 1$ b) $2(x-1)$
   c) $x + 1$ d) $x - 1$

10. If $y=4x^3-7x^4$ then dy/dx is
    a) $2x(-14x^2 + 6)$
    b) $2x(14x^2 - 6x)$
    c) $2x(-14x^2 + 6x)$
    d) None

11. If $u = 3t^4 + 5t^3 + 2t^2 + t + 4$, then the value of $\dfrac{du}{dt}$ at t = -1 is: *(Scanner)*
    a) 0   b) 1   c) 2   d) 5

12. If $y=7x^4+3x^3-9x+5$ then dy/dx is
    a) $28x^3+9(x+1)(x-1)$
    b) $28x^3+9(x+1)^2$
    c) $28x^3+9(x-1)^2$
    d) None

13. If $y=x+4x^{-1}-2x^{-7}$ then dy/dx is
    a) $1-4x^{-2} + 14x^{-8}$
    b) $1+4x^{-2} - 14x^{-8}$
    c) $1+4x^{-2} + 14x^{-8}$
    d) None

14. If $y = (4/3)x^3 - (6/7)x^7 + 4x^{-3}$ then dy/dx is
    a) $4x^2-6x^6-12x^{-4}$
    b) $4x^2+6x^6-12x^{-4}$
    c) $4x^2+6x^6+12x^{-4}$
    d) None

15. If $y=9x^4-7x^3+8x^2-8x^{-1}+10x^{-3}$ then dy/dx is
    a) $36x^3-21x^2+16x+8x^{-2}-30x^{-4}$
    b) $36x^3-21x^2+16x-8x^{-2}+30x^{-4}$
    c) $36x^3+21x^2+16x+8x^{-2}+30x^{-4}$
    d) None

16. If $y = x (x-1)(x-2)$ then $\dfrac{dy}{dx}$ is
    a) $3x^2 - 6x +2$ b) $-6x + 2$
    c) $3x^2 + 2$ d) none of these

c) $ax^{x-1} + a^x \log a$ 	 d) None of the above.

17. $y = \dfrac{1}{3}x^3 - 5x^2 + 6x - 21\log x + 3$ find $\dfrac{dy}{dx}$

   a) $x^2-10x+6-\dfrac{2}{x}$ 	 b) $x^2+10x+6-\dfrac{2}{x}$

   c) $x^2-10x-6+\dfrac{2}{x}$ 	 d) None

18. If $Y = x(x-1)(x-2)$ then dy/dx is
   a) $-6x$ 	 b) $3x^2 - 6x +2$
   c) $6x+4$ 	 d) $3x^2 - 6x$

19. $y = a^x + x^a + a^a$ find $\dfrac{dy}{dx}$

   a) $a^x \log a + ax^{a-1}$ 	 b) $a^x \log a + ax^{a+1}$
   c) $a^x \log a - ax^{a-1}$ 	 d) None

20. The derivative of $(x^2-1)/x$ is
   a) $1 + 1/x^2$ 	 b) $1-1/x^2$
   c) $1/x^2$ 	 d) none of these

21. The differential coefficients of $(x^2 + 1)/x$ is
   a) $1 + 1/x^2$ 	 b) $1-1/x^2$
   c) $1/x^2$ 	 d) none of these

22. $\dfrac{d}{dx}\left[2^{\log_2 x}\right] = $ _____ 	 *(Scanner)*

   a) 1 	 b) 0
   c) 1/2 	 d) $2^x . \log_2 x$

Set - B

1. $xy = 1$ then $y^2 + \dfrac{dy}{dx} = ?$ 	 *(Scanner)*

   a) 1 	 b) 0
   c) 2 	 d) None of the above

2. If $f(x) = x^2 - 6x + 8$ then $f'(5) - f'(8)$ is equal to
   a) $f'(2)$ 	 b) $3f'(2)$
   c) $2f'(2)$ 	 d) none of these

3. If $f(x) = x^k$ and $f'(1) = 10$ the value of k is
   a) 10 	 b) -10
   c) 1/10 	 d) none of these

4. Given, $y = (e^{a\log x} + e^{x\log a})$ then $\dfrac{dy}{dx}$ 	 *(Scanner)*

   a) $a\,x^{a-1} + a^x \log x$ 	 b) $a\,x^{a-1} + a^x \log a$

5. Let $f(x)\left(\sqrt{x} + \dfrac{1}{\sqrt{x}}\right)^2$ then f'(2) is equal to
   a) 3/4 	 b) 1/2
   c) 0 	 d) none of these

6. If $y = (x-x^{-1})^2$ then dy/dx is
   a) $2x-2x^{-3}$ 	 b) $2x+2x^{-3}$
   c) $2x+2x^3$ 	 d) $2x-2x^3$

7. If $y=(x^{1/3}-x^{-1/3})^3$ then dy/dx is
   a) $1+x^{-2}-x^{-2/3}-x^{-4/3}$ 	 b) $1+x^{-2}+x^{-2/3}-x^{-4/3}$
   c) $1+x^{-2}+x^{-2/3}+x^{-4/3}$ 	 d) None

8. If $y = [(1-x)/x]^2$ then dy/dx is
   a) $2(x^{-3} + x^{-2})$ 	 b) $2(-x^{-3} + x^{-2})$
   c) $2(x^{-3} - x^{-2})$ 	 d) None

Set - C

1. If $y = 1 + x + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \ldots\ldots + \dfrac{x^n}{n} + \ldots\ldots\ldots$ then

   $\dfrac{dy}{dx} = ?$

   a) y 	 b) -y
   c) 0 	 d) none of these

2. If $y = 1 + x + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \ldots\ldots + \dfrac{x^n}{n} + \ldots\ldots\infty$ then

   $\dfrac{dy}{dx} - y$ is equal to: 	 *(Scanner)*

   a) 1 	 b) - 1
   c) 0 	 d) None

3. If $f(x) = {}^xC_3$; then $f'(1) = ?$ 	 *(Scanner)*

   a) $\dfrac{1}{6}$

   b) $\dfrac{-1}{6}$

   c) $\dfrac{5}{6}$

   d) $\dfrac{-5}{6}$

Part - II
Product rule/Quotient rule

Set - A

1. $y = e^x \log x$ find $\dfrac{dy}{dx}$.

   a) $\dfrac{e^x}{x}(1 + x \log x)$

   b) $\dfrac{x}{e^x}(1 + x \log x)$

   c) $\dfrac{e^x}{x}(1 - x \log x)$

   d) None

2. $y = 2^x \cdot x^5$, find $\dfrac{dy}{dx}$.

   a) $x^5 \, 2^x \log_e 2 + 5.2^x \, x^4$

   b) $x^5 \, 2^x \log_e 2 - 5.2^x \, x^4$

   c) $x^5 \, 5.2^x \log_e 2 + 2^x \, x^4$

   d) None

3. $y = 2^x \log x$, find $\dfrac{dy}{dx}$.

   a) $\dfrac{2^x}{x} - 2^x \log 2 \log x$

   b) $\dfrac{2^x}{x} + 2^x \log 2 \log x$

   c) $\dfrac{x}{2^x} - 2^x \log 2 \log x$

   d) None

4. $\dfrac{d}{dx}(x.\log x)$ *(Scanner)*

   a) $x (1 + \log x)$

   b) $1 + \log x$

   c) $e^x \, x. \log x$

   d) $x^2 (\log x)$

5. The derivative of $x^2 \log x$ is

   a) $1 + 2\log x$

   b) $x(1 + 2 \log x)$

   c) $2 \log x$

   d) none of these

6. If $y=(3x^2+1) (x^3+2x)$ then dy/dx is

   a) $15x^4+21x^2+2$ b) $15x^3+21x^2+2$

   c) $15x^3+21x+2$ d) None

7. If $y=(3x^2+5) (2x^3+x+7)$ then dy/dx is

   a) $30x^4 +39x^2+42x+5$

   b) $30x^4 +39x^2+42x^2+5$

   c) $30x^4 +39x^2+42x+5x$

   d) None

8. If $f(x) = a^x \, x^a$ then find $f'(x)$.   *(Scanner)*

   a) $f(x) [a + \log a]$

   b) $f(x)\left[\dfrac{a}{x} - \log a\right]$

   c) $f(x)\left[\dfrac{a}{x} + \log a\right]$

   d) $f (x) [a + x \log a]$

9. $y = e^x / \log x$, find $\dfrac{dy}{dx}$.

   a) $\dfrac{e^{-x}(x\log x + 1)}{x(\log x)^2}$

   b) $\dfrac{e^x(x\log x + 1)}{x(\log x)^2}$

   c) $\dfrac{e^x(x\log x - 1)}{x(\log x)^2}$

   d) None

10. $y = \dfrac{x^2}{e^x}$, find $\dfrac{dy}{dx}$.

   a) $\dfrac{2xe^x - x^2 e^x}{(e^x)^2} = \dfrac{x(2-x)}{e^x}$

   b) $\dfrac{2xe^x + x^2 e^x}{(e^x)^2} = \dfrac{x(2-x)}{e^x}$

   c) $\dfrac{2xe^x - x^2 e^x}{(e^x)^2} = \dfrac{x(2+x)}{e^x}$

   d) None

11. If $y = \dfrac{x^4}{e^x}$ then $\dfrac{dy}{dx}$ is equal to

   a) $x^5 \, (4 - x)/(e^x)^1$

   b) $x^3(4 - x)/e^x$

   c) $x^2 \, (4 - x)/e^x$

   d) $x^3 \, (4x - 1)/e^x$

12. $y = \dfrac{2x}{3x^3 + 7}$ find $\dfrac{dy}{dx}$.

   a) $\dfrac{2(7 - 6x^3)}{(3x^3 + 7)^2}$ b) $\dfrac{2(7 + 6x^3)}{(3x^3 + 7)^2}$

   c) $\dfrac{2(7 - 6x^3)}{(3x^3 - 7)^2}$ d) None

13. If $f(x) = \dfrac{x^2+1}{x^2-1}$ then f'(x) is
   a) $-4x / (x^2 - 1)^2$
   b) $4x / (x^2 - 1)^2$
   c) $x / (x^2 - 1)^2$
   d) none of these

14. The derivative of $\dfrac{3-5x}{3+5x}$ is
   a) $30/(3+5x)^2$
   b) $1/(3+5x)^2$
   c) $-30/(3+5x)^2$
   d) none of these

Set - B

1. $f(x) = x^2/e^x$ then f'(1) is equal to _____.
   a) - 1/e   b) 1/e
   c) e   d) none of these

2. If $y=(x^{1/2}+2)/x^{1/2}$ then dy/dx is
   a) $-x^{-3/2}$
   b) $x^{-3/2}$
   c) $x^{3/2}$
   d) None

3. If y = (x + a) (x + b) (x + c) then dy/dx is
   a) $3x^2 + 2ax + 2bx + 2cx + ab + bc + ca$
   b) $2x^2 + 3ax + 3bx + 3cx + ab + bc + ca$
   c) $3x^2 + 2ax + 2bx + 2cx + 2ab + 2bc + 2ca$
   d) None

4. If $y=(x^2-1) / (x^2 + 1)$ then dy/dx is
   a) $4x(x^2+1)^{-2}$
   b) $4x(x^2+1)^2$
   c) $4x(x^2-1)^{-2}$
   d) None

5. If $y = \dfrac{e^x+1}{e^x-1}$ then $\dfrac{dy}{dx}$ is equal to
   a) $\dfrac{-2e^x}{(e^x-1)^2}$
   b) $\dfrac{2e^x}{(e^x-1)^2}$
   c) $\dfrac{-2}{(e^x-1)^2}$
   d) none of these

6. If $y = (3x^2 + 5x) (7x + 4)^{-1}$ then dy/dx is
   a) $(21x^2 + 24x + 20) (7x + 4)^{-2}$
   b) $(21x^2 + 20x + 24) (7x + 4)^{-2}$
   c) $(21x^2 + 24x + 4) (7x + 4)^{-2}$
   d) None

7. If $y = (2x + 1) (3x + 1) (4x + 1)^{-1}$ then dy/dx is
   a) $(24x^2 + 12x + 1) (4x + 1)^{-2}$
   b) $(24x^2 + 12x + 3) (4x + 1)^{-2}$
   c) $(24x^2 + 12x + 5) (4x + 1)^{-2}$
   d) None

8. If $y = (5x^4 -6x^2 -7x+8) / (5x-6)$ then dy/dx is
   a) $(75x^4 -120x^3 -30x^2 + 72x + 2) (5x-6)^{-2}$
   b) $(75x^4 -120x^3 +30x^2 - 72x + 2) (5x-6)^{-2}$
   c) $(75x^4 -120x^3 -30x^2 + 72x - 2) (5x-6)^{-2}$
   d) None

9. If $y=(x+1) (2x-1) / (x-3)$ then dy/dx is
   a) $2(x^2-6x-1)/(x-3)^2$
   b) $2(x^2+6x-1)/(x-3)^2$
   c) $2(x^2+6x+1)/(x-3)^2$
   d) None

10. If $y=2x^{3/2} (x^{1/2}+2) (x^{1/2}-1)$ then dy/dx is
   a) $4x+(5x-6) x^{1/2}$
   b) $4x+(5x-3) x^{1/2}$
   c) $4x+ (5x-2) x^{1/2}$
   d) None

Set - C

1. If y = $\dfrac{e^{3x} - e^{2x}}{e^{3x} + e^{2x}}$, then $\dfrac{dy}{dx}$ is equal to
   a) $2e^{5x}$
   b) $1/(e^{5x} + e^{2x})^2$
   c) $e^x / (1 + e^x)$
   d) $\dfrac{2e^x}{(e^x+1)^2}$

2. If f(x) = $\dfrac{4 - 2x}{2 + 3x + 3x^2}$ then the values of x for which f'(x) = 0 is
   a) $2(1\pm\sqrt{\dfrac{5}{3}})$
   b) $(1\pm\sqrt{3})$
   c) 2
   d) none of these

Part - III
Chain Rule
Set - A

1. If y=log5x then dy/dx is
   a) x^{-1} b) x
   c) $5x^{-1}$ d) 5x

2. The derivative of e^{3x^2-6x+2} is
   a) $30(1-5x)^5$
   b) $(1-5x)^5$
   c) $6(x-1)e^{3x^2-6x+2}$
   d) none of these

3. If $f(x) = e^{ax^2+bx+c}$ the f'(x) is
   a) e^{ax^2+bx+c}
   b) e^{ax^2+bx+c} (2ax+b)
   c) 2ax + b
   d) none of these

4. The derivative of y $= \sqrt{x+1}$ is
   a) $1/\sqrt{x+1}$ b) $-1/\sqrt{x+1}$
   c) $1/2\sqrt{x+1}$ d) none of these

5. If $y = e^{\sqrt{2x}}$ then $\dfrac{dy}{dx}$ is equal to ____.
   a) $\dfrac{e^{\sqrt{2x}}}{\sqrt{2x}}$ b) $e^{\sqrt{2x}}$
   c) $\dfrac{e^{\sqrt{2x}}}{\sqrt{2}\ x}$ d) none of these

6. If $f(x)=3e^{x^4}$ then $f'(x) - 4x^3 f(x) + \left(\frac{1}{3}\right) f(0) - f'(0)$ is equal to
   a) 0   b) e^{x^2}
   c) 1   d) -1

7. Let $y = \sqrt{2x} + 3^{2x}$ then $\dfrac{dy}{dx}$ is equal to
   a) $(1/\sqrt{2x}) + 2.3^{2x}\log_e 3$
   b) $1/\sqrt{2x}$
   c) $2.3^{2x}\log_e 3$
   d) none of these

Set - B

1. If $y=(3x^2-7)^{1/2}$ then dy/dx is
   a) $3x(3x^2-7)^{-1/2}$
   b) $6x(3x^2-7)^{-1/2}$
   c) $3x(3x^2-7)^{1/2}$
   d) None

2. If $y=(3x^3-5x^2+8)^3$ then dy/dx is
   a) $3(3x^3-5x^2+8)^2 (9x^2-10x)$
   b) $3(3x^3-5x^2+8)^2 (9x^2+10x)$
   c) $3(3x^3-5x^2+8)^2 (10x^2-9x)$
   d) None

3. If $y=(6x^5-7x^3+9)^{-1/3}$ then dy/dx is
   a) $(-1/3) (6x^5-7x^3+9)^{-4/3}(30x^4-21x^2)$
   b) $(1/3) (6x^5-7x^3+9)^{-4/3}(30x^4-21x^2)$
   c) $(-1/3) (6x^5-7x^3+9)^{4/3}(30x^4-21x^2)$
   d) None

4. If $y = (ax^2 + bx + c)^{1/2}$ then dy/dx is
   a) $(1/2) (2ax + b) (ax^2 + bx + c)^{-1/2}$
   b) $(-1/2) (2ax + b) (ax^2 + bx + c)^{-1/2}$
   c) $(1/2) (ax + 2b) (ax^2 + bx + c)^{-1/2}$
   d) None

5. If $y = (2x^4 + 3x^3 -5x+6)^{-1/3}$ then dy/dx is
   a) $(-1/3) (2x^4 + 3x^3 -5x + 6)^{-4/3} (8x^3 + 9x^2 -5)$
   b) $(1/3) (2x^4 + 3x^3 -5x + 6)^{-4/3} (8x^3 + 9x^2 -5)$
   c) $(1/3) (2x^4 + 3x^3 -5x + 6)^{4/3} (8x^3 + 9x^2 -5)$
   d) None

6. The derivative of the function $\sqrt{x+\sqrt{x}}$ is
   a) $\dfrac{1}{2\sqrt{x+\sqrt{x}}}$
   b) $1+\dfrac{1}{2\sqrt{x}}$
   c) $\dfrac{1}{2\sqrt{x+\sqrt{x}}}\left(1+\dfrac{1}{2\sqrt{x}}\right)$
   d) none of these

7. If $y = \log\sqrt{x+\sqrt{x^2+a^2}}$ then dy/dx is
   a) $(1/2) (x^2 + a^2)^{-1/2}$
   b) $(-1/2) (x^2 + a^2)^{-1/2}$
   c) $(1/2) (x^2 + a^2)^{1/2}$
   d) None

8. If $y = \log\left(\dfrac{5-4x^2}{3+5x^2}\right)$, then $\dfrac{dy}{dx} = $ ____ *(Scanner)*

   a) $\dfrac{8}{4x-5} - \dfrac{10}{3+5x}$

   b) $(4x^2 - 5) - (3 + 5x^2)$

   c) $\dfrac{8x}{4x^2-5} - \dfrac{10x}{3+5x^2}$

   d) 8x - 10

9. Differentiate the following w.r.t. x:

   $\log(x + \sqrt{x^2 + a^2})$

   a) $\dfrac{\sqrt{x^2 - a^2}}{1}$

   b) $\dfrac{1}{\sqrt{x^2 - a^2}}$

   c) $\dfrac{1}{\sqrt{x^2 + a^2}}$

   d) None

10. If $y = \sqrt{x^2 + m^2}$ then $y\, y_1$ (where $y_1 = dy/dx$) is equal to

    a) -x
    b) x
    c) 1/x
    d) none of these

11. If $y = \left(x + \sqrt{x^2 + m^2}\right)^n$ then dy/dx is equal to

    (Scanner)

    a) ny
    b) $ny/\sqrt{x^2 + m^2}$
    c) $-ny/\sqrt{x^2 + m^2}$
    d) none of these

12. If $y = \log[(x-1)^{1/2} - (x+1)^{1/2}]$ then dy/dx is
    a) $(1/2)\,(x^2 - 1)^{-1/2}$
    b) $(-1/2)\,(x^2 - 1)^{-1/2}$
    c) $(1/2)\,(x^2 - 1)^{1/2}$
    d) None

13. Differential Co-efficient of $\log_e$
    $\left(\sqrt{x-1} + \sqrt{x+1}\right)$ with respect to x is: *(Scanner)*

    a) $\dfrac{1}{2\sqrt{x^2 - 1}}$

    b) $\dfrac{1}{2\sqrt{x^2 + 1}}$

    c) $\dfrac{1}{2(x^2 - 1)}$

    d) $\dfrac{1}{\sqrt{x-1} + \sqrt{x+1}}$

14. Differentiate the following w.r.t. x:
    $\log\left(\sqrt{x-a} + \sqrt{x-b}\right)$.

    a) $\dfrac{1}{\sqrt{x-a}\sqrt{x-b}}$

    b) $\dfrac{1}{2\sqrt{x-a}\sqrt{x-b}}$

    c) $\dfrac{1}{4\sqrt{x-a}\sqrt{x-b}}$

    d) None

Set - C

1. If $y = +\sqrt{x/m} + \sqrt{m/x}$ then 2xy dy/dx – x/m + m/x is equal to
   a) 0
   b) 1
   c) -1
   d) none of these

2. If $y = (x + \sqrt{x^2 - 1})^m$ then $(x^2-1)\,(dy/dx)^2 - m^2y^2$ is ___
   a) -1   b) 1
   c) 0   d) none of these

3. If $y = e^x + e^{-x}$ then $\dfrac{dy}{dx} - \sqrt{y^2 - 4}$ is equal to
   a) 1   b) -1
   c) 0   d) none of these

4. If $y = [(x^2+a^2)^{1/2} + (x^2+b^2)^{1/2}]^{-1}$ then dy/dx is
   a) $x(a^2-b^2)^{-1}[(x^2+a^2)^{-1/2}-(x^2+b^2)^{-1/2}]$
   b) $(a^2-b^2)^{-1}[(x^2+a^2)^{-1/2}-(x^2+b^2)^{-1/2}]$
   c) $x(a^2-b^2)^{-1}[(x^2+a^2)^{1/2}+(x^2+b^2)^{1/2}]$
   d) $(a^2-b^2)^{-1}[(x^2+a^2)^{1/2}+(x^2+b^2)^{1/2}]$

Part - IV
Logarithmic Function
Set - A

1. Differentiate x^x w.r.t x.   *(Scanner)*
a) x^x (1 + log x)   b) y/x
c) - y/x   d) y + x^x log x

2. If y = x^x then the value of [dy/dx]/y is
a) logx + 1   b) logx-1
c) log(x+1)   d) None

3. If y = x^{logx} then dy/dx is
a) $2x^{logx-1}$.logx
b) x^{logx-1}.logx
c) $2x^{logx+1}$.logx
d) None

4. If y = $x^{1/x}$ then the value of [dy/dx]/y is
a) x^{-2}(1-logx)   b) x^2(1-logx)
c) x^{-2}(1+logx)   d) None

5. If y = $(1+x)^{2x}$ then the value of [dy/dx]/y is
a) $2[x(x+1)^{-1} + log(x + 1)]$
b) $x(x+1)^{-1} + log(x + 1)$
c) $2[x(x+1)^{-1} - log(x + 1)]$
d) None

6. Differentiate $e^{(x^x)}$:   *(Scanner)*
a) (1 + log x)
b) x^x (1 + log x)
c) $e^{(x^x)}$ (1 + log x)x^x
d) e^{x^x} (1+ log x)

7. If y=x^a + a^x + x^x + a^a a being a constant then dy/dx is
a) $ax^{a-1}+a^x loga+x^x$ (logx+1)
b) $ax^{a-1}+a^x loga+x^x$ (logx-1)
c) $ax^{a-1}+a^x loga-x^x$ (logx+1)
d) None

Set - B

1. If $y = x^{x^x}$ then the value of dy/dx is
a) x^{x^x} [x^{x-1} + logx.x^x (1+logx)]
b) x^{x^x} [x^{x-1} + logx. (1+logx)]
c) x^{x^x} [x^{x-1} + logx.x^x (1-logx)]
d) x^{x^x} [x^{x-1} + logx. (1-logx)]

2. If y = $(x^x)^x$ then dy/dx is
a) $x^{x^2+1}(1+2\log x)$
b) $x^{x^2+1}(1+\log x)$
c) $x^{x^2+1}(1-\log x)$
d) None

3. If y = $x^2 e^{5x} (3x + 1)^{-1/2}$ $(2x-1)^{-1/3}$ then the value of [dy/dx] / y is
a) $5+2x^{-1} - (3/2) (3x + 1)^{-1} - (2/3) (2x-1)^{-1}$
b) $5+2x^{-1} - (2/3) (3x + 1)^{-1} - (3/2) (2x-1)^{-1}$
c) $5+2x^{-1} - (2/3) (3x + 1)^{-1} + (3/2) (2x-1)^{-1}$
d) None

4. If y = $x^{1/2} (5-2x)^{2/3} (4-3x)^{-3/4} (7-4x)^{-4/5}$ then the value of [dy/dx]/y is
a) $(1/2)x^{-1} - (4/3) (5-2x)^{-1} + (9/4) (4-3x)^{-1} + (16/5) (7-4x)^{-1}$
b) $(1/2)x^{-1} - (3/4) (5-2x)^{-1} + (9/4) (4-3x)^{-1} + (16/5) (7-4x)^{-1}$
c) $(1/2)x^{-1} + (4/3) (5-2x)^{-1} + (9/4) (4-3x)^{-1} + (16/5) (7-4x)^{-1}$
d) None

5. If y = $e^{5/x} (2x^2 - 1)^{1/2}$ then the value of [dy/dx]/y is
a) $(2x^3 - 10x^2 + 5)x^{-2} (2x^2-1)^{-1}$
b) $(2x^3 - 5x^2 + 10)x^{-2} (2x^2-1)^{-1}$
c) $(2x^3 + 10x^2 - 5)x^{-2} (2x^2-1)^{-1}$
d) None

6. If y = $(2-x) (3-x)^{1/2} (1+x)^{-1/2}$ then the value of [dy/dx]/y is
a) $(x - 2)^{-1} + (1/2) (x - 3)^{-1} - (1/2) (1 + x)^{-1}$
b) $(x - 2)^{-1} + (x - 3)^{-1} - (1 + x)^{-1}$
c) $(x - 2)^{-1} - (1/2) (x - 3)^{-1} + (1/2) (1 + x)^{-1}$
d) None

7. If $y = \log \{ e^x[(x – 2) / (x + 3)]^{3/4}\}$ then dy/dx is
   a) $1 + (3/4) (x – 2)^{-1} – (3/4) (x + 3)^{-1}$
   b) $1 - (3/4) (x – 2)^{-1} + (3/4) (x + 3)^{-1}$
   c) $1 + (3/4) (x – 2)^{-1} + (3/4) (x + 3)^{-1}$
   d) None

8. If $y = (x+a) (x+b) (x + c) (x + d) / (x-a) (x-b) (x-c) (x-d)$ then the value of (dy/dx)/y is
   a) $(x + a)^{-1} + (x + b)^{-1} + (x + c)^{-1} + (x + d)^{-1} – (x – a)^{-1} - (x – b)^{-1} -(x – c)^{-1} - (x – d)^{-1}$
   b) $(x + a)^{-1} - (x + b)^{-1} + (x + c)^{-1} - (x + d)^{-1} + (x – a)^{-1} - (x – b)^{-1} + (x – c)^{-1} - (x – d)^{-1}$
   c) $(x + a)^{-1} + (x - b)^{-1} + (x - c)^{-1} + (x - d)^{-1} – (x + a)^{-1} - (x + b)^{-1} - (x + c)^{-1} - (x + d)^{-1}$
   d) None

9. If $y = \log[e^{3x}(5x-3)^{1/3} (4x+2)^{-1/3}]$ then dy/dx is
   a) $3+(1/3) [5/(5x-3)-4 / (4x+2)]$
   b) $3-(1/3) [5/(5x-3)-4 / (4x+2)]$
   c) $3+(1/3) [5/(5x-3)+4 / (4x+2)]$
   d) None

10. If $y = \sqrt{\dfrac{1-x}{1+x}}$, then $\dfrac{dy}{dx}$ is equal to – *(Scanner)*

    a) $\dfrac{y}{x^2 -1}$　　　　　b) $\dfrac{y}{1- x^2}$

    c) $\dfrac{y}{1+ x^2}$　　　　　d) $\dfrac{y}{y^2 -1}$

11. If $y = x^{\log(\log x)}$ then the value of [dy/dx]/y is given by
    a) $x^{-1}[1+\log(\log x)]$
    b) $x^{-1}[1-\log(\log x)]$
    c) $x[1+\log(\log x)]$
    d) $x [1-\log(\log x)]$

12. The derivative of $\log \left[e^x \left\{ \dfrac{x-2}{x+2} \right\}^{3/4} \right]$ is

    a) $\dfrac{x^2 +1}{x^2 +4}$

    b) $\dfrac{x^2 -1}{x^2 -4}$

    c) $\dfrac{1}{x^2 - 4}$

    d) none of these

1. If $f(x) = \left\{ \dfrac{(a + x)}{(1+ x)} \right\}^{a+1+2x}$ the value of f'(0) is

   a) a^{a+1}

   b) $a^{a+1}\left[\dfrac{1-a^2}{a} + 2\log a \right]$

   c) $2 \log a$
   d) none of these

Part - V
Implicit Function
Set - A

1. If $x^3 – 2x^2 y^2 + 5x + y -5 = 0$ then $\dfrac{dy}{dx}$ at x = 1, y = 1 is equal to
   a) 4/3　　　　　　　　b) -4/3
   c) 3/4　　　　　　　　d) none of these

2. If $x^3 – xy^2 + 3y^2 + 2 = 0$ then dy/dx is
   a) $(y^2 – 3x^2) / [2y(3-x)]$
   b) $(y^2 – 3x^2) / [2y(x-3)]$
   c) $(y^2 – 3x^2) / [2y(3+x)]$
   d) None

3. If $x^2 – y^2 + 3x – 5y = 0$ then dy/dx is
   a) $(2x+3) (2y+5)^{-1}$
   b) $(2x+3) (2y-5)^{-1}$
   c) $(2x-3) (2y-5)^{-1}$
   d) None

4. If $x^3 – 2x^2y^2 + 5x + y = 5$, then $\dfrac{dy}{dx}$ at x = 1 and y = 1 is: *(Scanner)*
   a) 4/3　　　　　　　b) - 5/4
   c) 4/5　　　　　　　d) - 4/3

5. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ then dy/dx is
   a) -(ax + hy + g) / (hx + by + f)
   b) (ax + hy + g) / (hx + by + f)
   c) (ax - hy + g) / (hx - by + f)
   d) None

6. If $\dfrac{x^2}{a^2} - \dfrac{y^2}{a^2} = 1$, $\dfrac{dy}{dx}$ can be expressed as

    a) $\dfrac{x}{y}$

    b) $\dfrac{x}{\sqrt{x^2 - a^2}}$

    c) $\dfrac{1}{\sqrt{\dfrac{x^2}{a^2} - 1}}$

    d) none of these

7. If $x^2 + 3xy + y^2 - 4 = 0$ then dy/dx is
    a) -(2x + 3y) / (3x + 2y)
    b) (2x + 3y) / (3x + 2y)
    c) -(3x + 2y) / (2x + 3y)
    d) (3x + 2y) / (2x + 3y)

8. If $x^3 + 5x^2 y + xy - 5 = 0$ then dy/dx is
    a) -(3x² + 10xy + y) / [x(5x + 1)]
    b) (3x² + 10xy + y) / [x(5x + 1)]
    c) -(3x² + 10xy + y) / [x(5x - 1)]
    d) None

9. If $x^2 + y^2 - 2x = 0$ then dy/dx is
    a) (1-x) / y
    b) (1+x) / y
    c) (x-1) / y
    d) None

10. For the curve $x^2 + y^2 + 2gx + 2hy = 0$, the value of $\dfrac{dy}{dx}$ at (0, 0) is
    a) -g/h
    b) g/h
    c) h/g
    d) none of these

Set - B

1. If $2^x - 2^y = 2^{x-y}$ then $\dfrac{dy}{dx}$ at x = y = 2   *(Scanner)*
    a) 1   b) 2
    c) 4   d) 5

2. If xy (x − y) = 0, find $\dfrac{dy}{dx}$:   *(Scanner)*

    a) $\dfrac{y(2x - y)}{x(2y - x)}$

    b) $\dfrac{x(2x - y)}{y(2y - x)}$

    c) $\dfrac{y(2y - x)}{x(2x - y)}$

    d) None of these

3. $x^3 + y^3 - 3axy = 0$, $\dfrac{dy}{dx}$ can be found out as

    a) $\dfrac{ay - x^2}{y^2 + ax}$

    b) $\dfrac{ay - x^2}{y^2 - ax}$

    c) $\dfrac{ay + x^2}{y^2 + ax}$

    d) none of these

4. If $x^m y^n = (x +)^{m+n}$, then find $\dfrac{dy}{dx}$:   *(Scanner)*
    a) $\dfrac{x}{y}$ b) $\dfrac{y}{x}$
    c) xy   d) None

5. If $x^p y^q = (x+y)^{p+q}$, then $\dfrac{dy}{dx}$ is equal to ____
                                                        (Scanner)
    a) $\dfrac{q}{p}$ b) $\dfrac{x}{y}$
    c) $\dfrac{y}{x}$ d) $\dfrac{p}{q}$

6. If $(x+y)^{m+n} - x^m y^n = 0$ then dy/dx is
    a) y/x   b) -y/x
    c) x/y   d) -x/y

7. If $y = x^{x^{x.....\infty}}$ then dy/dx is
    a) y² / [x(1-ylogx)]
    b) y² / (1-ylgx)
    c) y² / [x(1+ylogx)]
    d) y² / (1+ylogx)

8. If $y = \sqrt{x}^{\sqrt{x.....\infty}}$ then $\dfrac{dy}{dx}$ is equal to _____

    a) $\dfrac{y^2}{2 - y \log x}$ *(Scanner)*

    b) $\dfrac{y^2}{x(2 - y \log x)}$

    c) $\dfrac{y^2}{\log x}$

    d) none of these

9. If log (x/y) = x + y, $\dfrac{dy}{dx}$ may be found to be

    a) $\dfrac{y(1 - x)}{x(1 + y)}$ b) $\dfrac{y}{x}$

    c) $\dfrac{1 - x}{1 + y}$ d) none of these

10. Given $e^{-xy} – 4xy = 0$, $\frac{dy}{dx}$ can be proved to be

   (Scanner)

   a) - y/x   b) y/x
   c) x/y   d) none of these

11. If $x^y = e^{x-y}$ then dy/dx is   *(Scanner)*
   a) logx / (1-logx)^2
   b) logx / (1+logx)^2
   c) logx / (1-logx)
   d) logx / (1+logx)

12. If $y = \log_y x$, then $\frac{dy}{dx}$ is equal to: *(Scanner)*

   a) $\frac{1}{x+logy}$

   b) $\frac{1}{x+x\log y}$

   c) $\frac{1}{1+xlogy}$

   d) $\frac{1}{y+logx}$

13. If $x = y \log (xy)$, then $\frac{dy}{dx}$ is equal to: *(Scanner)*

   a) $\frac{x+y}{dxx(1+logxy)}$ b) $\frac{x-y}{x(1+logxy)}$

   c) $\frac{x+y}{x(logx+logy)}$ d) $\frac{x-y}{x(logx+logy)}$

Set - C

1. If $x^y.y^x = M$, where M is constant then $\frac{dy}{dx}$ is

   equal to

   a) $\frac{-y}{x}$

   b) $\frac{-y (y + x \log y)}{x (y \log x + x)}$

   c) $\frac{y + x\log y}{y \log x + x}$

   d) none of these

2. If $x^y = y^x$, then $\frac{dy}{dx}$ gives :   *(Scanner)*

   a) $\dfrac{x(x \log y - y)}{y(y \log x - x)}$

   b) $\dfrac{x(y \log x - x)}{y(x \log y - y)}$

   c) $\dfrac{y(x \log y - y)}{x(y \log x - x)}$

   d) None of these

3. If $x(1 + y)^{1/2} + y (1 + x)^{1/2} = 0$ then dy/dx is
   a) -(1+x)$^{-2}$ b) (1+x)$^{-2}$
   c) -(1+x^2)$^{-2}$ d) (1+x^2)$^{-2}$

Part - VI
Parametric Function
Set - A

1. Given $x = at^2$, $y = 2at$; $\frac{dy}{dx}$ is calculated as

   (Scanner)
   a) t   b) -1/t
   c) 1/t   d) none of these

2. Given $x = 2t + 5$, $y = t^2 – 2$; $\frac{dy}{dx}$ is calculated as

   (Scanner)
   a) t   b) -1/t
   c) 1/t   d) none of these

3. $x = 2t + 5$ and $y = t^2 – 5$, then $\frac{dy}{dx}$=?

   (Scanner)
   a) t   b) - 1/t
   c) 1/t   d) 0

4. If $x = 3t^2 -1$, $y = t^3 –t$, then $\frac{dy}{dx}$ is equal to

   a) $\dfrac{3t^2 -1}{6t}$ b) 3t^2-1

   c) $\dfrac{3t -1}{6t}$ d) none of these

5. If $x = c\, t$, $y = c/t$, then $\frac{dy}{dx}$ is equal to:

   (Scanner)
   a) 1/t   b) t.e^t
   c) -1/t^2 d) None of these.

6. If $x = \log t$, $y = e^t$, then $\frac{dy}{dx}$=   *(Scanner)*
   a) 1/t   b) t.e^t
   c) - 1/t2   d) None of these

7. Let $x = at^3$, $y = \frac{a}{t^2}$ Then $\frac{dy}{dx}$=   *(Scanner)*
   a) $\frac{-1}{t^6}$
   b) $\frac{-3a}{t^6}$
   c) $\frac{1}{3at^6}$
   d) None of the above

8. If $x = at^2$, $y = 2at$ then $\left[\dfrac{dy}{dx}\right]_{t=2}$ is equal to

   (Scanner)

   a) 1/2
   b) -2
   c) -1/2
   d) none of these

9. If $x = at^3 + bt^2 - t$ and $y = at^2 - 2bt$, then the value of $\dfrac{dy}{dx}$ at $t = 0$ is : *(Scanner)*

   a) 2b   b) -2b
   c) $\dfrac{1}{2b}$ d) $-\dfrac{1}{2b}$

   ## Set - B

1. Given $x = t + t^{-1}$ and $y = t - t^{-1}$ the value of $\dfrac{dy}{dx}$

   at $t = 2$ is
   a) 3/5   b) -3/5
   c) 5/3   d) none of these

2. If $x = (1 - t^2)/(1 + t^2)$ $y = 2t/(1 + t^2)$ then dy/dx at $t = 1$ is _____.
   a) 1/2
   b) 1
   c) 0
   d) none of these

   ## Set - C

1. If $x = 3at / (1+t^3)$, $y = 3at^2/(1 + t^3)$, then dy/dx is
   a) $(2t - t^4) / (1-2t^3)$
   b) $(2t - t^4) / (1+2t^3)$
   c) $(2t + t^4) / (1+2t^3)$
   d) None

Part - VII
Second order derivative
Set - B

1. If $y = ae^{mx} + be^{-mx}$ then d^2y/dx^2 is
   a) m^2y b) my
   c) $-m^2y$ d) $-my$

2. If $y = ae^{nx} + be^{-nx}$, then $\dfrac{d^2y}{dx^2}$ is equal to ___
   (Scanner)
   a) n^2y b) $-n^2y$
   c) ny d) None of these

3. If $y = (\log x) / x$ then d^2y/dx^2 is
   a) $(2\log x-3) / x^3$
   b) $(3\log x-2) / x^3$
   c) $(2\log x+3) / x^3$
   d) None

4. Find the second derivative of $y = \sqrt{x + 1}$
   (Scanner)
   a) $\frac{1}{2} (x + 1)^{-1/2}$
   b) $-1/4 (x + 1)^{-3/2}$
   c) $1/4 (x+1)^{-1/2}$
   d) None of these

5. If $y = x^m e^{nx}$ then d^2y/dx^2 is
   a) $m(m-1)x^{m-2}e^{nx} + 2mnx^{m-1} e^{nx} + n^2 x^m e^{nx}$
   b) $m(1-m)x^{m-2}e^{nx} + 2mnx^{m-1} e^{nx} + n^2 x^m e^{nx}$
   c) $m(m+1)x^{m-2}e^{nx} + 2mnx^{m-1} e^{nx} + n^2 x^m e^{nx}$
   d) None

6. If $y = x^x$ then $\dfrac{d^2Y}{dx^2} = $ ___ *(Scanner)*
   a) $\dfrac{dY}{dx}(1 + \log x) + Y \dfrac{d}{dx}(1 + \log x)$
   b) $\dfrac{dY}{dx}(1 + \log x) + \dfrac{d}{dx}(1 + \log x)$
   c) $\dfrac{dY}{dx}(1 + \log x) - Y \dfrac{d}{dx}(1 + \log x)$
   d) $\dfrac{dY}{dx}(1 + \log x) - \dfrac{d}{dx}(1 + \log x)$

7. Find the fourth derivative of $\log [(3x+4)^{1/2}]$
   a) $-243(3x+4)^{-4}$
   b) $243(3x+4)^{-4}$
   c) $-243(4x+3)^{-4}$
   d) None

Set - C

1. For the functions $y = x^3 - 3x$, the value of $\frac{d^2y}{dx^2}$ at which $\frac{dy}{dx}$ is zero, is *(Scanner)*
   a) ± 1 b) ± 3
   c) ± 6 d) None of these.

2. If $y = ae^{2x} + bxe^{2x}$ where a and b are constants the value of the expression $d^2y/dx^2 - 4dy/dx + 4y$ is ___.
   a) 0   b) 1
   c) -1   d) None

3. If $x^2 + y^2 = 4$ then *(Scanner)*
   a) $y\frac{d^2y}{dx^2} - \left(2\frac{dy}{dx}\right)^2 + 1 = 0$
   b) $y\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 1 = 0$
   c) $y\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 - 1 = 0$
   d) $y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + 1 = 0$

4. If $x = at^2$ and $y = 2$ at then d^2y/dx^2 is
   a) $1/(2at^3)$
   b) $-1/(2at^3)$
   c) $2at^3$
   d) None

5. If $x = (1 - t) / (1 + t)$ and $y = (2t) / (1 + t)$ then d^2y/dx^2 is
   a) 0   b) 1
   c) -1   d) None

Set - D

1. If $y = (x+1)^{1/2} - (x-1)^{1/2}$ the value of the expression $(x^2-1) d^2y / dx^2 + xdy / dx - y/4$ is given by
   a) 0
   b) 1
   c) -1
   d) None

2. If $y = \log[x+(1+x^2)^{1/2}]$ the value of the expression $(x^2 + 1) d^2y / dx^2 + xdy / dx$ is ____.
   a) 0   b) 1
   c) -1   d) None

3. If $y = [x+(1+x^2)^{1/2}]^m$ then the value of the expression $(1+x^2)d^2y / dx^2 + xdy/dx - m^2y$ is
   a) 0   b) 1
   c) -1   d) None

4. If $y = a[x+(x^2-1)^{1/2}]^n + b[x-(x^2-1)^{1/2}]^n$ the value of the expression $(x^2-1)d^2y / dx^2 + xdy / dx - n^2y$ is ____.
   a) 0
   b) 1
   c) -1
   d) None

Part - VIII
Slope Gradient
Set - A

1. Find the gradient of the curve $y = 3x^2 - 5x + 4$ at the point (1, 2).
   a) -1
   b) 0
   c) 1
   d) None

2. The gradient of the curve $y = 2x^3 - 3x^2 - 12x + 8$ at $x = 0$ is
   a) -12 b) 12
   c) 0   d) none of these

3. The gradient of the curve $y = 2x^3 - 5x^2 - 3x$ at $x = 0$ is
   a) 3
   b) -3
   c) 1/3
   d) none of these

4. The slope of the tangent at the point (2 -2) to the curve $x^2 + xy + y^2 - 4 = 0$ is given by *(Scanner)*
   a) 0
   b) 1
   c) -1
   d) None

Set - B

1. The slope of the tangent to the curve $y = \frac{x-1}{x+2}$ at x = 2 is: ***(Scanner)***
   a) $\frac{3}{16}$ b) $-\frac{3}{16}$

   c) $\frac{1}{4}$ d) $-\frac{1}{4}$

2. The curve $y^2 = ux^3 + v$ passes through the point P(2, 3) and $\frac{dx}{dy} = 4$ at P. The values of u and v are
   a) (u = 2, v = 7)   b) (u = 2, v = -7)
   c) (u = -2, v = -7)   d) (0, -1)

3. The gradient of the curve y + px + qy = 0 at (1, 1) is ½. The values of p and q are
   a) (-1, 1)   b) (2, -1)
   c) (1, 2)   d) (0, -1)

4. The gradient of the curve y – xy + 2px + 3qy = 0 at the point (3, 2) is $\frac{-2}{3}$. The values of p and q are
   a) (1/2, 1/2)   b) (2, 2)
   c) (-1/2, -1/2)   d) (1/2, 1/6)

5. The equation of the tangent to the curve, $f = x^3 - 2x + 3$, at the point (2, 7) is ___   ***(Scanner)***
   a) y = 2x – 13   b) y = 10x
   c) y = 10x – 13   d) y = 10

Set - C

1. The slope of the tangent to the curve $y = x^2 - x$ at the point, where the line y = 2 cuts the curve in the Ist quadrant, is
   a) 2   b) 3
   c) -3   d) none of these

2. The slope of the tangent to the curve y = $\sqrt{4-x^2}$ at the point, where the ordinate and the abscissa are equal, is   ***(Scanner)***
   a) -1   b) 1
   c) 0   d) none of these

3. The points on the curve $y = x^3 - x^2 - x + 1$, where the tangent is parallel to x – axis are   ***(Scanner)***
   a) $\left(\frac{-1}{3}, \frac{32}{27}\right)$ and (1,0)   b) (0, 0) and (1,0)
   c) (1,0) and (1,1)   d) (0, 1) and (1, 1)

Part - IX
Applications of derivatives
Set - A

1. The cost function for the production of x units of a commodity is given by
   $C(x) = 2x^3 - 15x^2 + 36x + 15$
   The cost will be minimum when 'x' is equal to   ***(Scanner)***
   a) 3   b) 2
   c) 1   d) 4

2. If the given cost function of commodity is given by $C = 150x - 5x^2 + \frac{x^3}{6}$, here C stands for cost and x stands for output, if the average cost is equal to the marginal cost then the output x = ___.   ***(Scanner)***
   a) 5   b) 10
   c) 15   d) 20

3. The total cost function of a firm is $C(x) = \frac{x^3}{3} - 5x^2 + 28x + 10$ where C(x) is the total cost and x is output. A tax at the rate of Rs.2 per unit of output is imposed and the producer adds it to his cost. If the market demand function is given by p = (2530 – 5x) where p is the price per unit of output, find the output maximizing profit
   a) 50   b) 80.
   c) 75   d) none

4. The total cost function of a firm is $C(x) = \frac{x^3}{3} - 5x^2 + 28x + 10$ where C(x) is the total cost and x is output. A tax at the rate of Rs.2 per unit of output is imposed and the producer adds it to his cost. If the market demand function is given by p = (2530 – 5x) where p is the price per unit of output, find the price per unit maximizing profit.
   a) Rs.2080   b) Rs.2280.
   c) Rs.2575   d) none

5. The cost function of a company is given by:

$C(x) = 100x - 8x^2 + \dfrac{x^3}{3}$, where x denotes the output. Find the level of output at which: marginal cost is minimum

a) 6   b) 7
c) 8   d) 9

6. The cost function of a company is given by:

$C(x) = 100x - 8x^2 + \dfrac{x^3}{3}$, where x denotes the output. Find the level of output at which: average cost is minimum

a) 52   b) 12
c) 14   d) none

7. The cost function of a company is given by:

$C(x) = 100x - 8x^2 + \dfrac{x^3}{3}$, where x denotes the output. Find the minimum Average cost

a) 55   b) 52
c) 65   d) none

8. The cost of producing x units is $500 - 20x^2 + x^3/3$. The marginal cost is minimum at $x =$ _____.

a) 5   b) 10
c) 20   d) 50

9. In a market there are 30 shops to allocate to people. If they allocate x shops then their monthly profit, in rupees, is given by, $P(x) = -8x^2 + 400x - 1000$, then the number of shops should they allocate to maximize the profit.

a) 0   b) 30
c) 25   d) 10

10. The cost of function $C(x) = 125 + 500x - x^2 + x^3/3, 0 \le x \le 100$ and the demand function for the items is given by. $p(x) = 1500 - x$, then the marginal profit when 18 items are sold is

a) 751   b) 571
c) 676   d) 875

11 A computer software company wishes to start the production of floppy disks. It was observed that the company had to spend Rs.2 lakhs for the technical information. The cost of setting up the machine is Rs.88,000 and the cost of producing each unit is Rs.30, while each floppy could be sold at Rs.45. Find the total cost function for producing x floppies

a) 30x + 2,88,000   b) 30x + 2,80,000
c) 30x - 2,88,000   d) none

12. A computer software company wishes to start the production of floppy disks. It was observed that the company had to spend Rs.2 lakhs for the technical informations. The cost of setting up the machine is Rs.88,000 and the cost of producing each unit is Rs.30, while each floppy could be sold at Rs.45. Find the break-even point.

a) 20,200   b) 19,200
c) 15,200   d) none

13. A company decided to set up a small production plant for manufacturing electronic clocks. The total cost for initial set up (fixed cost) is Rs.9 lakhs. The additional cost for producing each clock is Rs.300. each clock is sold at Rs.750. During the first month, 1,500 clocks are produced and sold.
What profit or loss the company incurs during the first month, when all the 1,500 clocks are sold?

a) 2,15,000profit   b) 2,25,000 profit
c) 2,25,000loss   d) 2,20,000 loss

14. A company decided to set up a small production plant for manufacturing electronic clocks. The total cost for initial set up (fixed cost) is Rs.9 lakhs. The additional cost for producing each clock is Rs.300. each clock is sold at Rs.750. During the first month, 1,500 clocks are produced and sold.
Determine the break-even point.

a) 1,500   b) 2,000
c) 3,000   d) none

15. The speed of a train at a distance x (from the starting point) is given by $3x^2 - 5x + 4$. What is the rate of change (of distance) at $x = 1$?

a) -1   b) 0
c) 1   d) 2

☻☻☻☻

Chap- 8B- INTEGRATION

Part - I
Direct
(Module + Scanner)
Set – A

1. Integrate w.r.t x, $x^{6/5}$
    a) $(5/11)x^{11/5}$+ k
    b) $(11/5)x^{11/5}$+ k
    c) $(1/5)x^{1/5}$+ k
    d) None

2. Integrate w.r.t x, $x^{4/3}$
    a) $(3/7)x^{7/3}$+ k
    b) $(7/3)x^{7/3}$+ k
    c) $(1/3)x^{1/3}$+ k
    d) None

3. Integrate w.r.t x, $x^{-1/2}$
    a) $2x^{1/2}$ + k
    b) $(1/2)x^{1/2}$ + k
    c) $-(3/2)x^{-3/2}$ + k
    d) None

4. Integrate w.r.t x, $5x^2$
    a) $(5/3)x^3$ + k
    b) $(3/5)x^3$ + k
    c) 5x + k
    d) 10x

5. Integration of $3 - 2x - x^4$ will become
    a) $- x^2 - x^5/5$
    b) $3x - x^2 - \dfrac{x^5}{5} + k$
    c) $3x - x^2 + \dfrac{x^5}{5} + k$
    d) none of these

6. Evaluate $\int (x^2 - 1)\, dx$
    a) $x^5/5 - 2/3\ x^3 + x + k$
    b) $\dfrac{x^3}{3} - x + k$
    c) 2x
    d) none of these

7. $\int (x^4 + 3/x)\, dx$ is equal to
    a) $x^5/5$ + 3 log |x|
    b) $1/5\ x^5$ + 3 log |x| + k
    c) $1/5x^5$ + k
    d) none of these

8. Given f(x) = $4x^3 + 3x^2 - 2x + 5$ and $\int f(x)\, dx$ is
    a) $x^4 + x^3 - x^2 + 5$
    b) $x^4 + x^3 - x^2 + 5x + k$
    c) $12x^2 + 6x - 2x^2$
    d) none of these

9. $\int (1 - 3x)(1 + x)\, dx$ is equal to
    a) $x - x^2 - x^3$
    b) $x^3 - x^2 + x$
    c) $x - x^2 - x^3 + k$
    d) none of these

10. Integrate w.r.t x, $(3x^{-1} + 4x^2 - 3x + 8)$
    a) $3\log x - (4/3)x^3 + (3/2)x^2 - 8x + k$
    b) $3\log x + (4/3)x^3 - (3/2)x^2 + 8x + k$
    c) $3\log x + (4/3)x^3 + (3/2)x^2 + 8x + k$
    d) None

11. Integrate w.r.t x, $(3 - 2x - x^4)$
    a) $3x - x^2 - x^5/5$ + k
    b) $3x + x^2 - x^5/5$ + k
    c) $3x + x^2 + x^5/5$ + k
    d) None

12. Integrate w.r.t x, $(x^4 + 1) / x^2$
    a) $x^3/3 - 1/x$ + k
    b) $1/x - x^3/3$ + k
    c) $x^3/3 + 1/x$ + k
    d) None

13. Integrate w.r.t x, $(4x^3 + 3x^2 - 2x + 5)$
    a) $x^4 + x^3 - x^2 + 5x$ + k
    b) $x^4 - x^3 + x^2 - 5x$ + k
    c) $x^4 + x^3 - x^2 + 5x$ + k
    d) None

14. Integrate w.r.t x, $(x^{1/2} - x^{-1/2})$
    a) $(2/3)x^{3/2} - 2x^{1/2} + k$
    b) $(3/2)x^{3/2} - (1/2)x^{1/2} + k$
    c) $-(1/2)x^{-1/2} - (3/2)x^{-3/2} + k$
    d) None

15. Integrate w.r.t x, $(7x^2 - 3x + 8 - x^{-1/2} + x^{-1} + x^{-2})$
    a) $(7/3)x^3 - (3/2)x^2 + 8x - 2x^{1/2} + \log x - x^{-1} + k$
    b) $(3/7)x^3 - (2/3)x^2 + 8x - (1/2)x^{1/2} + \log x + x^{-1} + k$
    c) $(7/3)x^3 + (3/2)x^2 + 8x + 2x^{1/2} + \log x + x^{-1} + k$
    d) None

16. $\int \left[\sqrt{x} - 1/\sqrt{x} \right] dx$ is equal to

    a) $\dfrac{2}{3}x^{3/2} - 2x^{1/2} + k$

    b) $\dfrac{2}{3}\sqrt{x} - 2\sqrt{x} + k$

    c) $\dfrac{1}{2\sqrt{x}} + \dfrac{1}{2x\sqrt{x}} + k$

    d) None

17. Integrate $(x + a)^n$ and the result will be
    a) $\dfrac{(x+a)^{n+1}}{n+1} + k$ b) $\dfrac{(x+a)^{n+1}}{n+1}$
    c) $(x + a)^{n+1}$ d) none of these

18. $\int (4x+5)^6 dx$

    a) $1/28\ (4x + 5)^7 + k$
    b) $(4x + 5)^7/7 + k$
    c) $(4x + 5)^7/7$
    d) none of these

19. $\int a^x\, dx$ *(Scanner)*
    a) $x^1 (1 + \log x)$
    b) $1 + \log x$
    c) $x.\log x$
    d) $\dfrac{a^x}{\log a} + c$

20. $\int (a)^{2x} dx$ _____   *(Scanner)*
    a) $\dfrac{a^{2x}}{2\log a} + c$
    b) $\dfrac{2\,a^{2x}}{\log a} + c$
    c) $\dfrac{a^{2x}.\log a}{2} + c$
    d) None of these

21. $\int_0^2 3x^2 dx$ is
    a) 7   b) -8
    c) 8   d) none of these

22. Evaluate $\int_1^4 (2x+5)\, dx$ and the value is
    a) 3   b) 10
    c) 30   d) none of these

23. $\int_1^4 (2x + 5) dx$ and the value is: *(Scanner)*
    a) 10   b) 3
    c) 30   d) None

24. Evaluate $\int_0^1 (2x^2 - x^3)\, dx$ and the value is
    a) $4/3 + k$ b) 5/12
    c) - 4/3   d) none of these

25. $\int_1^3 (1 + 3x - x^3) dx$ is equal to   *(Scanner)*
    a) - 6   b) 6
    c) 3   d) None

Set – B

1. Integrate w.r.t x, $(x^{1/2} - x/2 + 2x^{-1/2})$
    a) $(2/3)x^{3/2} - (1/4)x^2 + 4x^{1/2} + k$
    b) $(3/2)x^{3/2} - (1/4)x^2 + 4x^{1/2}$
    c) $(2/3)x^{3/2} + (1/4)x^2 + 4x^{1/2}$
    d) None

2. Integrate w.r.t x, $(1-3x)(1+x)$
    a) $x - x^2 - x^3 + k$ b) $x - x^2 + x^3 + k$
    c) $x + x^2 + x^3 + k$ d) None

3. Integrate w.r.t x, $(ax + bx^{-3} + cx^{-7})x^2$
    a) $(1/4)ax^4 + b\log x - (1/4)cx^{-4} + k$
    b) $4ax^4 + b\log x - 4cx^{-4} + k$
    c) $(1/4)ax^4 + b\log x + (1/4)cx^{-4} + k$
    d) None

4. Integrate w.r.t x, $x^{-1}[ax^3 + bx^2 + cx + d]$
    a) $(1/3)ax^3 + (1/2)bx^2 + cx + d \log x + k$
    b) $3ax^3 + 2bx^2 + cx + d \log x + k$
    c) $2ax + b - dx^{-2} + k$
    d) None

5. Integrate w.r.t x, $x^{-3}[4x^6+3x^5+2x^4+x^3+x^2+1]$
   a) $x^4 + x^3 + x^2 + x + \log x - (1/2)x^{-2} + k$
   b) $x^4 + x^3 + x^2 + x + \log x + (1/2)x^{-2} + k$
   c) $x^4 + x^3 + x^2 + x + \log x + 2x^{-2} + k$
   d) None

6. Integrate w.r.t x, $[2^x + (1/2)e^{-x} + 4x^{-1} - x^{-1/3}]$
   a) $2^x / \log 2 - (1/2)e^{-x} + 4\log x - (3/2)x^{2/3} + k$
   b) $2^x / \log 2 + (1/2)e^{-x} + 4\log x + (3/2)x^{2/3} + k$
   c) $2^x / \log 2 - 2e^{-x} + 4\log x - (2/3)x^{2/3} + k$
   d) None

7. Integrate w.r.t x, $(x^2 - 3x + x^{1/3} + 7)x^{-1/2}$
   a) $(2/5)x^{5/2} - 2x^{3/2} + (6/5)x^{5/6} + 14x^{1/2} + k$
   b) $(5/2)x^{5/2} - 2x^{3/2} + (5/6)x^{5/6} + 14x^{1/2} + k$
   c) $(2/5)x^{5/2} + 2x^{3/2} + (6/5)x^{5/6} + 14x^{1/2} + k$
   d) None

8. $\int \sqrt{x} + \frac{1}{\sqrt{x}}dx$ *(Scanner)*
   a) $2x^{1/2}\left(\frac{1}{3}x - 1\right) + k$
   b) $2x^{1/2}\left(\frac{1}{3}x + 1\right) + k$
   c) $2\left(\frac{1}{3}x + x^{1/2}\right) + k$
   d) None of these

9. Integrate w.r.t x, $(x^2 - 1)^2$
   a) $x^5/5 - (2/3)x^3 + x + k$
   b) $x^5/5 + (2/3)x^3 + x + k$
   c) $x^5/5 + (3/2)x^3 + x + k$
   d) None

10. Integrate w.r.t x, $\left(x - \dfrac{1}{x}\right)^3$
    a) $x^4/4 - (3/2)x^2 + 3\log x + x^{-2}/2 + k$
    b) $x^4/4 + (3/2)x^2 + 3\log x + x^{-2}/2 + k$
    c) $x^4/4 - (2/3)x^2 + 3\log x + x^{-2}/2 + k$
    d) None

11. Evaluate the integral $\int (1-x)^3 / x\, dx$ and the answer is equal to
    a) $\log |x| - 3x + 3/2x^2 + k$
    b) $\log x - 2 + 3x^2 + k$
    c) $\log x + 3x^2 + k$
    d) none of these

12. If $f'(x) = 3x^2 - \frac{2}{x^2}$, $f(1) = 0$ and $f(x) = $ ___.
    (Scanner)
    a) $\frac{x^3}{3} - x^2 - 2$
    b) $x^3 + x^2 + 2$
    c) $x^3 + \frac{2}{x} - 3$
    d) None

13. $\int_0^4 \sqrt{3x+4}\, dx$ is equal to
    a) 9/112   b) 112/9
    c) 11/9   d) none of these

14. The value of $\int_0^{1/2} \frac{dx}{\sqrt{3-2x}}$ is   *(Scanner)*
    a) 1
    b) $1 - \sqrt{3/2}$
    c) $\sqrt{3} - \sqrt{2}$
    d) c) $\sqrt{2} - \sqrt{3}$

15. Evaluate $\int_2^4 (3x-2)^2\, dx$ and the value is
    a) 104   b) 100
    c) 10   d) none of these.

16. $\int_0^4 \frac{(x+1)(x+4)}{\sqrt{x}}\, dx$ is equal is
    a) $51\frac{1}{5}$ b) 48/5
    c) 48   d) $55\frac{7}{15}$

17. Integrate w.r.t x, $(2x+3)^{1/2}$ from lower limit 3 to upper limit 11 of x
    a) 33
    b) 100/3
    c) 98/3
    d) None

18. $\int \log(a^x)dx = $ *(Scanner)*
    a) $\log a\left(\frac{x^2}{2}\right) + c$
    b) $\log a\left(\frac{x}{2}\right) + c$
    c) $x \log a^x + c$
    d) $x \log a^x + c$

19. $\int \dfrac{e^{\log_e x}}{x}\, dx$ is : *(Scanner)*

   a) x^{-1} + C   b) x + C
   c) x^2 + C   d) None

20. The integral of $(e^{3x} + e^{-3x}) / e^x$ is : *(Scanner)*

   a) $\dfrac{e^{2x}}{2} + \dfrac{e^{-4x}}{4}$ + C
   b) $\dfrac{e^{2x}}{2} - \dfrac{e^{-4x}}{4}$ + C
   c) $e^{2x} - e^{-4x}$ + C
   d) None of these

21. $\int_0^1 (e^x + e^{-x})dx$ is : *(Scanner)*

   a) $e - e^{-1}$
   b) $e^{-1} - e$
   c) $e + e^{-1}$
   d) one

22. $\int\limits_0^2 \dfrac{x+2}{x+1}\, dx$ is

   a) 2 + $\log_e 2$ b) 2 + $\log_e 3$
   c) $\log_e 3$ d) none of these

23. $\int_0^1 \left(\dfrac{1-x}{1+x}\right)dx$: *(Scanner)*

   a) 2 log 2 − 1
   b) 4 log 2 − 1
   c) 2 log 2
   d) None of these

24. The value of $\int_1^2 \dfrac{1-x}{1+x}$ dx is equal to : *(Scanner)*

   a) $\log\dfrac{3}{2} - 1$
   b) 2 log $\dfrac{3}{2}$ − 1
   c) $\dfrac{1}{2}\log\dfrac{3}{2}$ − 1
   d) $\dfrac{1}{2}$ log $\dfrac{2}{3}$ − 1

Set – C

1. $\int \dfrac{1}{\sqrt{3x+4}-\sqrt{3x+1}}\, dx.$ *(Scanner)*

   a) $\dfrac{2}{27}$ [(3x + 4)$^{3/2}$ − (3x + 1)$^{3/2}$] + c
   b) $\dfrac{2}{27}$[(3x + 4)$^{3/2}$ + (3x + 1)$^{3/2}$] + c
   c) $\dfrac{2}{3}$[(3x + 4)$^{3/2}$ − (3x + 1)$^{3/2}$] + c
   d) None of these.

2. $\int 2^{3x}.3^{2x}.5^x.dx =$ ___ *(Scanner)*

   a) $\dfrac{2^{3x}.3^{2x}.5^x}{\log (720)}$ + c
   b) $\dfrac{2^{3x}.3^{2x}.5^x}{\log (360)}$ + c
   c) $\dfrac{2^{3x}.3^{2x}.5^x}{\log (180)}$ + c
   d) $\dfrac{2^{3x}.3^{2x}.5^x}{\log (90)}$ + c

3. If f′(x) = x − 1, the equation of a curve y = f(x) passing through the point (1, 0) is given by
   a) y = x^2 − 2x + 1
   b) y = x^2 / 2 - x + 1
   c) y = x^2 / 2 - x + 1/2
   d) none of these

4. The equation of the curve in the form y = f(x) if the curve passes through the point (1, 0) and f′(x) = 2x − 1 is
   a) y = x^2 − x
   b) x = y^2 − y
   c) y = x^2
   d) none of these

5. The equation of the curve which passes through the point (1, 3) and has the slope 4x − 3 at any point (x, y) is
   a) y = $2x^3$ − 3x + 4
   b) y = $2x^2$ − 3x + 4
   c) x = $2y^2$ − 3y + 4
   d) none of these

Part - II
Substitution
Set – A

1. $\int\limits_1^2 \dfrac{2x}{1+x^2}\, dx$ is equal to

   a) $\log_e$ (5/2)
   b) $\log_e 5 - \log_e 2$ + k
   c) $\log_e$ (2/5)
   d) none of these

2. $\int_1^2 \dfrac{x}{x^2+2}dx =$ ___ *(Scanner)*
   a) $\log\sqrt{2}$ b) log $\sqrt{3}$
   c) $\log\dfrac{1}{\sqrt{2}}$ d) log $\dfrac{1}{\sqrt{3}}$

3. The value of $\int_1^2 \frac{x}{x^2+1}dx$ is equal to : *(Scanner)*
    a) $\log_e\left(\frac{5}{2}\right)$
    b) $\frac{1}{2}\log_e\left(\frac{5}{2}\right)$
    c) $\log_e(5) - \log_e2 + c$
    d) None of these.

4. Evaluate $\int\left(\frac{e^x - e^{-x}}{e^x + e^{-x}}\right)dx$ and the value is

    a) $\log_e |e^x + e^{-x}|$
    b) $\log^e |e^x + e^{-x}| + k$
    c) $\log_e |e^x + e^{-x}| + k$
    d) none of these

5. $\int x(x^2 + 4)^5 dx$ is equal to   *(Scanner)*
    a) $(x^2 + 4)^6 + c$
    b) $\frac{1}{12}(x^2 + 4)^6 + c$
    c) $\frac{1}{6}(x^2 + 4)^6 + c$
    d) None of the above

6. $\int x(x^2 + 4)^5 dx$

    a) $(x^2 + 4)^6 + k$
    b) $1/12 (x^2 + 4)^6 + k$
    c) $(x^2 + 4)^6/ + k$
    d) none of these

7. Integrate w.r.t x, $x(x^2+3)^{-2}$
    a) $-(1/2)(x^2 + 3)^{-1} + k$
    b) $(1/2)(x^2 + 3)^{-1} + k$
    c) $2(x^2 + 3)^{-1} + k$
    d) None

8. Integrate w.r.t x, $(x^2 + 1)^{-n} 3x$
    a) $(3/2)(x^2 + 1)^{1-n}/(1-n) + k$
    b) $(3/2)(x^2 + 1)^{1-n}/(1-n)$
    c) $(2/3)(x^2 + 1)^{1-n}/(1-n) + k$
    d) None

9. Integrate w.r.t x, $(x^3 + 2)^2 3x^2$
    a) $(1/3)(x^3+2)^3 + k$
    b) $3(x^3+2)^3 + k$
    c) $3x^2(x^3+2)^3 + k$
    d) $9x^2(x^3+2)^3 + k$

10. $\int 8x^2 / (x^3 + 2)^3 dx$ is equal to

    a) $-4/3(x^3 + 2)^2 + k$

    b) $-\frac{4}{3(x^3 + 2)^2} + k$
    c) $\frac{4}{3(x^3 + 2)^2} + k$
    d) none of these

11. Integrate w.r.t x, $(x^3 + 2)^{1/2}x^2$
    a) $(2/9)(x^3 + 2)^{3/2} + k$
    b) $(2/3)(x^3 + 2)^{3/2} + k$
    c) $(9/2)(x^3 + 2)^{3/2} + k$
    d) None

12. Integrate w.r.t x, $(x^3 + 2)^{-3} 8x^2$
    a) $-(4/3)(x^3 + 2)^{-2} + k$
    b) $(4/3)(x^3 + 2)^{-2} + k$
    c) $(2/3)(x^3 + 2)^{-2} + k$
    d) None

13. Integrate w.r.t x, $(x^3 + 2)^{-1/4}x^2$
    a) $(4/9)(x^3 + 2)^{3/4} + k$
    b) $(9/4)(x^3 + 2)^{3/4} + k$
    c) $(3/4)(x^3 + 2)^{3/4} + k$
    d) None

Set – B

1. $\int \frac{1}{x(1+logx)^2}dx$ is equal to   *(Scanner)*
    a) $-\frac{1}{2(1+logx)^2} + C$
    b) $\frac{1}{(1+logx)} + C$
    c) $-\frac{1}{(1+logx)} + C$
    d) None of these

2. Integrate w.r.t x, $1/[x(logx)^2]$
    a) $-1/logx + k$
    b) $1/logx + k$
    c) $logx$
    d) None

3. $\int_0^2 \frac{3\sqrt{x}}{\sqrt{X}}dx$ is equal to = ____   *(Scanner)*

    a) $\frac{2\sqrt{2}}{log_e^3}$
    b) 0
    c) $\frac{2}{log_e^3}(3^{\sqrt{2}} - 1)$
    d) $\frac{3\sqrt{2}}{\sqrt{2}}$

4. Integrate w.r.t x, 1/[xlogxlog(logx)]
   a) log[log(logx)]+k
   b) log (logx)+k
   c) logx + k
   d) x^{-1}

5. Integrate with respect to x, $1/[x(\log x)^2]$
   a) $-1/\log x + k$
   b) $1/\log x + k$
   c) $\log x$
   d) x

6. Evaluate $\int_0^{e^2} \dfrac{dx}{x(1+\log x)^2}$ and the value is and the value is
   a) 3/2 　　　　　　　 b) 2/3
   c) 26/3 　　　　　 d) 1/2 (log$_e$5)

7. $\int (e^x + e^{-x})^2 (e^x - e^{-x}) dx$ is
   a) $\dfrac{1}{3}(e^x + e^x)^3 + k$
   b) $\dfrac{1}{2}(e^x - e^{-x})^2 + k$
   c) $e^x + k$
   d) none of these

8. Solve : $\int \dfrac{(\log x^x)^2}{x^3}.dx$ 　　　*(Scanner)*
   a) $\dfrac{3}{2}$ (log x)^3 + c
   b) $\dfrac{1}{3}$ (log x)^3 + c
   c) $\dfrac{1}{6}$ (log x)^3 + c
   d) $\dfrac{3}{7}$ (log x)^3 + c

9. $\int x^x (1 + \log x) dx$ is equal to
   a) x^x logx + k
   b) e^{x2} + k
   c) $\dfrac{x^2}{2} + k$
   d) x^x + c

10. Evaluate $\int_1^2 \left(\dfrac{x^2-1}{x^2}\right) e^{x+\frac{1}{x}} dx$. The value is
    a) e^2 ($\sqrt{e}$ − 1)
    b) e^2 [$\sqrt{e}$ − 1] + k
    c) $e^2 \sqrt{e}$
    d) none of these

11. The value of $\int_0^2 xe^{x^2} dx$ is 　　*(Scanner)*
    a) 1
    b) e − 1
    c) (e/2) − 1
    d) $\dfrac{1}{2}$ (e^4 − 1)

12. Integrate w.r.t x, (x^2 + 1)$^{-3}$x^3
    a) -(1/4) (2x^2 + 1) / (x^2+ 1)^2 + k
    b) (1/4) (2x^2 + 1) / (x^2+ 1)^2 + k
    c) -(1/4) (2x^2 + 1) / (x^2+ 1) + k
    d) (1/4) (2x^2 + 1) / (x^2+ 1) + k

13. The value of $\int_1^e \dfrac{(1+logx)}{x}$ dx is : [Given Loge = 1]
    　　　　　　　　　　　　　　　　　　　　(Scanner)
    a) ½ 　　　　　　　 b) 3/2
    c) 1 　　　　　　　 d) 5/2

Set – C

1. Find $\int \dfrac{x^3}{(x^2+1)^3}dx$: 　　*(Scanner)*
   a) $\dfrac{1}{4}\left[\dfrac{2x^2+1}{(x^2+1)^2}\right]$+ C
   b) $-\dfrac{1}{4}\left[\dfrac{2x^2+1}{(x^2+1)^2}\right]$+ C
   c) $\dfrac{1}{2}\left[\dfrac{2x^2+1}{(x^2+1)^2}\right]$+ C
   d) $-\dfrac{1}{2}\left[\dfrac{2x^2+1}{(x^2+1)^2}\right]$+ C

2. $\int_0^1 \dfrac{dx}{[ax+b(1-x)]^2}dx$ = ___ 　　*(Scanner)*
   a) a/b
   b) b/a
   c) ab
   d) 1/ab

Part - III
Product rule
Set – A

1. $\int \log x\, dx$ is equal to
   a) x logx + k
   b) x logx − x^2 + k
   c) x log x + k
   d) none of these

2. Integrate w.r.t x, xlogx
    a) $(1/4)x^2\log(x^2/e) + k$
    b) $(1/2)x^2\log(x^2/e) + k$
    c) $(1/4)x^2\log(x/e) + k$
    d) None

3. Using integration by parts $\int x^3 \log x\, dx$

    a) $x^4/16 + k$
    b) $x^4/16 \,(4 \log x - 1) + k$
    c) $4 \log x - 1 + k$
    d) none of these

4. Evaluate $\int x\, e^x dx$ *(Scanner)*
    a) $e^x (x + 1) + c$
    b) $e^x (x- 1) + c$
    c) $e^x + c$
    d) $x - e^x + c$

5. $\int x^2 e^x\ dx$.   *(Scanner)*
    a) $2x.e^x$
    b) $e^x (x^2 - 2x)$
    c) $x^2 . e^x - e^x . (2x) + 2$
    d) $e^x (x - 1)$

6. $\int x^2 e^{3x} dx$ is :   *(Scanner)*
    a) $x^2.e^{3x} - 2xe^{3x} + 2e^{3x} + C$
    b) $\frac{e^{3x}}{3} - \frac{x.e^{3x}}{9} + 2e^{3x} + C$
    c) $\frac{x^2.e^{3x}}{3} - \frac{2x.e^{3x}}{9} + \frac{2}{27} e^{3x} + C$
    d) None of these

Set – B

1. Evaluate $\int_{0}^{1} xe^x$ dx and the value is

    a) -1   b) 10
    c) 10/9   d) +1

2. $\int \log x^2 dx$ is equal to

    a) $x (\log x - 1) + k$
    b) $2x (\log x - 1) + k$
    c) $2 (\log x - 1) + k$
    d) none of these

3. $\int_{1}^{2} x\log x\, dx$ is equal to

    a) 2 log 2
    b) - 3/4
    c) 2 log 2 – ¾
    d) none of these

4. $\int \log(\log x)\,/\,x\, dx$ is

    a) log (log x – 1) + k
    b) log x – 1 + k
    c) log x [log (log x) – 1] + c
    d) none of these

5. Integrate w.r.t x, x^n logx
    a) $x^{n+1} (n+1)^{-1}[\log x-(n+1)^{-1}] + c$
    b) $x^{n-1} (n-1)^{-1}[\log x-(n-1)^{-1}] + c$
    c) $x^{n+1} (n+1)^{-1}[\log x+(n+1)^{-1}] + c$
    d) None

6. $\int (\log x)^2 x\, dx$ is equal to

    a) $\dfrac{x^2}{2}\left[(\log x)^2 - \log x + \dfrac{1}{2} \right]+ k$

    b) $(\log x)^2 - \log x + \dfrac{1}{2} + k$

    c) $\dfrac{x^2}{2}\left[(\log x)^2 + \dfrac{1}{2} \right]+ k$

    d) none of these

7. $\int (\log x)^2\ dx$ & the result is put logx = t = $\therefore$ x = e^t
    a) x (logx)^2 – 2x logx + 2x + k
    b) x (logx)^2– 2x + k
    c) 2x logx – 2x + k
    d) none of these

Part - IV
Integrals of the type
Set – A

$$\int \frac{1}{x^2 - a^2} dx, \int \frac{1}{a^2 - x^2} dx, \int \frac{1}{\sqrt{a^2 + x^2}}, \int \frac{1}{\sqrt{x^2 - a^2}}$$

1. $\int \dfrac{1}{x^2 - a^2}$

    a) $\log x - \dfrac{a}{x+a} + k$

    b) log (x – a) – log (x + a) + k

    c) $\dfrac{1}{2a} \log\left(\dfrac{x-a}{x+a} \right) + k$

    d) none of these

2.   Evaluate : $\int \dfrac{dx}{\sqrt{x^2 + a^2}}$:   *(Scanner)*

a) $\dfrac{1}{2}\log(x+\sqrt{x^2+a^2}) + C$

b) $\log(x+\sqrt{x^2+a^2}) + C$

c) $\log(x\sqrt{x^2+a^2}) + C$

d) $\dfrac{1}{2}\log(x\sqrt{x^2+a^2}) + C$

Set – B

1.   Integrate w.r.t x, $(25-x^2)^{-1}$ from lower limit 3 to upper limit 4 of x
a) $(3/4)\log(1/5) + k$
b) $(1/5)\log(3/2)$
c) $(1/5)\log(4/3) + k$
d) $(3/4)\log5 + k$

Set – C

1.   Integrate w.r.t x, $(3x + 7)(2x^2 + 3x − 2)^{-1}$
a) $(3/4)\log(2x^2 + 3x − 2) + (19/20)\log[(2x − 1)/\{2(x + 2)\}] + k$
b) $(3/4)\log(2x^2 + 3x − 2) + \log[(2x − 1)/\{2(x + 2)\}] + k$
c) $(3/4)\log(2x^2 + 3x − 2) + (19/20)\log[2(2x − 1)(x + 2)] + k$
d) None

2.   Integrate w.r.t x, $(x+1)(3+2x-x^2)^{-1}$
a) $-(1/2)\log(3+2x-x^2)+(1/2)\log[(x+1)/(x-3)]+c$
b) $(1/2)\log(3+2x-x^2)+(1/2)\log[(x+1)/(x-3)]+c$
c) $-(1/2)\log(3+2x-x^2)+(1/2)\log[(x-3)/(x+1)]+c$
d) None

3.   Integrate w.r.t x, $(x+1)(5x^2+8x-4)^{-1/2}$
a) $(1/5)(5x^2 + 8x-4)^{1/2} + [1/(5\sqrt{5})]\log[5\{x+4/5+(x^2 + 8x/5-4/5)^{1/2}(1/6)\}]+c$
b) $(1/5)(5x^2 + 8x-4)^{1/2} + [1/(5\sqrt{5})]\log[5\{x+4/5+(x^2 - 8x/5+4/5)^{1/2}(1/6)\}]+c$
c) $(1/5)(5x^2 + 8x-4)^{1/2} + [1/(5\sqrt{5})]\log[(5x+4)/5 + (x^2 + 8x/5-4/5)^{1/2}]+c$
d) None

Set – D

1.   Integrate w.r.t x, $(5x^2 + 8x + 4)^{-1/2}$
a) $(1/\sqrt{5})\log[\{\sqrt{5}x+4/\sqrt{5} +(5x^2+8x + 4)^{1/2}\}]+c$
b) $\sqrt{5}\log[\{\sqrt{5}x+4/\sqrt{5} +(5x^2+8x + 4)^{1/2}\}]+c$
c) $(1/\sqrt{5})\log[\{\sqrt{5}x+4/\sqrt{5} +(5x^2+8x + 4)^{1/2}\}]+c$
d) None

Part - V
Integrals of the type
Set – A
$$\int e^x\{f(x)+ f'(x)\}dx = e^x f(x)+C.$$

1.   The value of $\int e^x[f(x)+ f^1(x)]dx = $ ____
                                                    (Scanner)

a) $e^x f(x) + c$

b) $e^x f^1(x) + c$

c) $\left[\dfrac{f^1(x)}{f(x)}\right]+c$

d) $e^x\left[\dfrac{f(x)}{f^1(x)}\right]+c$

2. $\int e^x(x^2 + 2x)dx = $ *(Scanner)*
a) $x^x. e^2 + c$ b) $e^x . x + c$
c) $e^x x^2 + c$ d) $-e^x . x + c$

3. $\int \dfrac{e^x(x\log x+1)}{x}dx$ is equal to
a) $e^x \log x + k$
b) $e^x + k$
c) $\log x + k$
d) none of these

4.   Integrate w.r.t x, $e^x(1 + x\log x)x^{-1}$
a) $e^x \log x + k$
b) $-e^x \log x + k$
c) $e^x x^{-1} + k$
d) None

Set – B

1. $\int_{1}^{e} \dfrac{e^x(x\log_e x+1)}{x}\,dx$ is equal to:

   (Scanner)
   a) e + 1   b) e^e
   c) e – 1   d) $e^x + 1$

2. $\int xe^x/(x+1)^2\,dx$ is equal to
   a) $e^x/(x+1) + k$
   b) $e^x / x + k$
   c) $e^x + k$
   d) none of these

3. $\int xe^x(x+1)^{-2}\,dx$
   a) $e^x (x+1)^{-1} + c$
   b) $e^x (x+1)^{-2}$
   c) $xe^x (x+1)^{-1} + c$
   d) None

4. Integrate w.r.t x, $e^x (1 + x) (2 + x)^{-2}$
   a) $e^x (2+x)^{-1} + k$
   b) $-e^x (2+x)^{-1} + k$
   c) $(1/2)e^x (2+x)^{-1} + k$
   d) None

5. Evaluate $\int \dfrac{(2-x)e^x}{(1-x)^2}\,dx$ and the value is

   a) $\dfrac{e^x}{1-x}+k$ b) $e^x + k$

   c) $\dfrac{1}{1-x}+k$ d) none of these

6. $\int \dfrac{e^x}{(1+x)^3}\,dx - \int \dfrac{e^x}{2(1+x)^2}\,dx = $ _____   *(Scanner)*

   a) 0

   b) $\dfrac{e^x}{2(1+x)^2}+C$

   c) $-\dfrac{e^x}{2(1+x)^2}+C$

   d) $\dfrac{e^x}{(1+x)^2}+C$

Part - VI
Partial fraction

Set – A

1. Evaluate $\int \dfrac{1}{(x-1)(x-2)}\,dx$:

   (Scanner)
   a) $\log\left(\dfrac{x-2}{x-1}\right)+C$

   b) $\log [(x-2)(x-1)] + C$

   c) $\log\left(\dfrac{x-2}{x-1}\right)+C$

   d) None

Set – B

1. $\int \dfrac{6x+4}{(x-2)(x-3)}\,dx$ is equal to   *(Scanner)*
   a) 22 log (x-3) – 16 (x-2)
   b) 11 log (x-3) – 8 (x-2)
   c) 22 log (x-3) -16 log (x-2)
   d) 22 log (x-3) + 16 log (x-2)

2. Integrate w.r.t x, $x(x-1)^{-1} (2x + 1)^{-1}$
   a) $(1/3) [\log(x-1)+(1/2)\log(2x+1)]+k$
   b) $(1/3) [\log(x-1)+\log (2x+1)]+k$
   c) $(1/3) [\log(x-1)-(1/2)\log(2x+1)]+k$
   d) None

3. Integrate w.r.t x, $1/(2x^2-x-1)$
   a) $(1/3)\log [(x-1)/(2x+1)]+c$
   b) $-(1/3)\log [2(x-1)/(2x+1)]+c$
   c) $(1/3)\log [2(1-x)/(2x+1)]$
   d) None

4. $\int \dfrac{3x}{\left(x^2-x-2\right)}\,dx$ is

   a) $2 \log_e |x - 2| + \log_e |x + 1| + k$
   b) $2 \log_e |x - 2| - \log_e |x + 1| + k$
   c) $\log_e |x - 2| + \log_e |x + 1| + k$
   d) none of these

5. The value of $\int_0^1 \dfrac{dx}{(1+x)(2+x)}$ is: *(Scanner)*
   a) $\log\frac{3}{4}$ b) $\log \frac{4}{3}$
   c) log 12   d) None

6. $\int (x+5)dx/(x+1)(x+2)^2$
   a) 4 log (x + 1) – 4 log (x + 2) + 3/x + 2 + k

b) $4 \log (x + 2) - 3/x + 2 + k$

c) $4 \log (x + 1) - 4 \log (x + 2)$

d) none of these

7. Integrate w.r.t x, $(x-x^3)^{-1}$
   a) $(1/2)\log[x^2/(1-x^2)]+ k$
   b) $(1/2)\log[x^2/(1-x^2)]$
   c) $(1/2)\log[x^2/(1+x^2)]+ k$
   d) None

Set – C

1. $\int \dfrac{1}{x(x^5 + 1)} dx$ *(Scanner)*

   a) $\log \dfrac{x^5}{x^5-1}+C$ b) $\dfrac{1}{5}\log\left(\dfrac{x^5}{x^5+1}\right)+C$

   c) $\dfrac{1}{3}\log\left(\dfrac{x^5}{x^5+1}\right)+C$ d) $\dfrac{1}{3}\log\left(\dfrac{x^5+1}{x^5}\right)+C$

2. $\int \dfrac{x}{(x^2+1)(x^2+2)} dx$ is equal to _____   *(Scanner)*

   a) $\log\left(\dfrac{x^2+1}{x^2+2}\right)+c$

   b) $\dfrac{1}{2}\log\left(\dfrac{x^2+1}{x^2+2}\right)+c$

   c) $\dfrac{1}{2}\log\left(\dfrac{x^2+2}{x^2+1}\right)+c$

   d) $-\log\left(\dfrac{x^2+1}{x^2+2}\right)+c$

3. Integrate w.r.t x, $x^3[(x-a)(x-b)(x-c)]^{-1}$ given that $1/A=(a-b)(a-c)/a^3$, $1/B=(b-a)(b-c)/b^3$, $1/C = (c-a)(c-b)/c^3$
   a) $x + A\log(x-a) + B\log(x - b) + C\log(x - c) + k$
   b) $A\log(x-a) + B\log(x - b) + C\log(x - c) + k$
   c) $1 + A\log(x-a) + B\log(x - b) + C\log(x - c) + k$
   d) None

Part - VII
Properties of definite Integration
Set – A

1. $\int\limits_{0}^{a}[f(x)+f(-x)]dx$ is equal to, f(x) is odd function.

a) $\int\limits_{0}^{a} 2f(x)dx$

b) $\int\limits_{-a}^{a} f(x)dx$

c) 0

d) $\int\limits_{-a}^{a} -f(x)dx$

2. Find the value of $\int\limits_{-3}^{3} x\sqrt{8-x^2}\,dx$ *(Scanner)*
   a) 1   b) -1
   c) 0   d) None of these

3. The value of $\int\limits_{2}^{3} f(5-x)dx-\int\limits_{2}^{3} f(x)dx$ is:

                                         (Scanner)
   a) 1   b) 0
   c) - 1   d) None

Set – B

1. $\int\limits_{-1}^{1}(2x^2 - x^3)dx$ *(Scanner)*
   a) 4/3   b) 1
   c) 2   d) 2/3

2. Solve : $\int\limits_{-1}^{1}(e^x - e^{-x})\,dx$ *(Scanner)*
   a) 0
   b) 1
   c) 12
   d) None of these above

3. The value of $\int_{-2}^{2} f(x)\,dx$, where $f(x) = 1 + x, x \leq 0; f(x) = 1 - 2x, x \geq 0$ is
   a) 20   b) -2
   c) -4   d) 0

4. The value of $\int_{0}^{2} \dfrac{\sqrt{x}}{\sqrt{x}+\sqrt{2-x}}\,dx$ is: *(Scanner)*
   a) 0   b) 3
   c) 2   d) 1

5. $\int\limits_{0}^{5} \dfrac{x^2 dx}{x^2 + (5-x)^2}$ is equal to _____.   *(Scanner)*
   a) 5

b) $\dfrac{5}{2}$

c) 1

d) none of these

6. $\int_2^3 \dfrac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx =$ *(Scanner)*

a) 1   b) 1/2

c) 2   d) 3/2

Set – C

1. $\int\limits_{-1}^{1}\dfrac{|x|}{x}\,dx = $ _____   *(Scanner)*

a) - 1   b) 0

c) 1   d) 2

2. $I = \int_{-5}^{0} 1x + 21\ dx$

a) $\dfrac{13}{2}$ b) $\dfrac{20}{2}$

c) $\dfrac{30}{3}$ d) $\dfrac{42}{2}$

3. $I = \int_{-3}^{3} 1x - 11\ dx$

a) 50   b) 10

c) 70   d) 40

Part - VIII
Other
Set – A

1. If $f(x) = \sqrt{1+x^2}$ then $\int f(x)dx$ is

a) $\dfrac{2}{3}$ x $(1 + x^2)^{3/2}$ + k

b) $\dfrac{x}{2}\sqrt{1+x^2} + \dfrac{1}{2}\log(x+\sqrt{x^2+1})+k$

c) $\dfrac{2}{3}x(1+x^2)^{3/2}+k$

d) none of these

2. $\int (x^2 + 1)/\sqrt{x^2 + 2}$ is equal to
a) $\dfrac{x}{2}\left(\sqrt{x^2+2}\right)+k$
b) $\sqrt{x^2+2}+k$
c) $1/(x^2+2)^{3/2} + k$
d) none of these

Set – B

1. The value of definite integral $\int_0^2 |1 - x| =$ _____
(Scanner)

a) 0

b) 1/2

c) 3/2

d) 1

☙☙☙☙