CHAPTER

3

Theory of Production and Cost

- **Unit 1:** Theory of Production
- **Unit 2:** Theory of Cost

UNIT

1 Theory of Production

MEANING OF PRODUCTION

- Generally, production refers to the process of converting inputs into output.
- According to James Bates and J.R. Parkinson "Production is the organized activity of transforming resources into finished products in the form of goods and services; and the objective of production is to satisfy the demand of such transformed resources".
- Production should not be taken to mean as the creation of matter, but it means to create or add utility to things that already exist in nature. For example, when a carpenter produces a table, he does not create the matter of which the wood is composed of; he only transforms wood into a table. By doing so, he adds utility to wood which did not have utility before.
- Production consists of various processes to add utility to natural resources for gaining greater satisfaction from them by:

(a) Form Utility:

- Manufacturing processes transform raw materials into physical products with utility.
- **Examples:** Turning a log of wood into a table or converting iron into a machine.

(b) Place Utility:

(i) Extraction from Earth:

- Resources like coal, minerals, and gold are extracted from mines and supplied to markets.
- Enables utilization of resources that were previously inaccessible or of little use.

(ii) Transfer to Areas of Greater Use:

- Goods are moved from locations where they provide limited satisfaction to places where their utility is higher.
- **Example 1:** Tin in Malaya becomes valuable when transported to industrial centers with the necessary technology for metal box production.
- **Example 2:** Apples in Kashmir orchards gain utility when transported to densely populated city centers where more people can benefit from them.
- Transportation systems, transport workers, and marketing agents contribute to this utility of place.

(c) Time Utility:

- Materials are made available during periods when they are typically unavailable.
- Harvested food grains are stored for use between harvests.

- Seasonal fruits are canned to be enjoyed during the off-season.
- Confers utility by providing access to resources when they are most needed.

(d) Service Utility (Personal Skills):

- Personal skills in the form of services contribute to utility.
- Examples: Organizers, merchants, transport workers, and other service providers.
- Their expertise and efforts enhance the overall utility of goods and services.

> Production does not include work done within a household by anyone out of love and affection, voluntary services and goods produced for self-consumption. Intention to exchange in the market is an essential component of production.

FACTORS OF PRODUCTION

- Factors of production are inputs that a firm purchases for use in its production process.
- The four factors of production are land, labour, capital, and entrepreneurial ability.
- Land refers to natural resources and is a free gift of nature.
- Labour represents human effort and is a key factor in the production process.
- Capital refers to the tools, machinery, and infrastructure used in production.
- Entrepreneurial ability encompasses the skills and innovation required to organize and manage the production process.
- All four factors are essential in producing goods and services, even something as simple as a small piece of bread cannot be produced without these factors of production.

1. **Land:** The term 'land' is used in a special sense in Economics. It does not mean soil or earth's surface alone, but refers to all free gifts of nature which would include besides land in common parlance, natural resources, fertility of soil, water, air, light, heat natural vegetation etc.

Characterstics of Land:

(a) Land is a free gift of nature: No human effort is required for making land available for production. It has no supply price in the sense that no payment has been made to mother nature for obtaining land.

(b) Supply of land is fixed: Land is strictly limited in quantity. It is different from other factors of production in that, no change in demand can affect the amount of land in existence. In other words, the total supply of land is perfectly inelastic from the point of view of the economy. However, it is relatively elastic from the point of view of a firm.

(c) Land is permanent and has indestructible powers: Land is permanent in nature and cannot be destroyed. According to Ricardo, land has certain original and indestructible powers and these properties of land cannot be destroyed.

(d) Land is a passive factor: Land is not an active factor. Unless human effort is exercised on land, it does not produce anything on its own.

(e) Land is immobile: In the geographical sense. Land cannot be shifted physically from one place to another. The natural factors typical to a given place cannot be shifted to other places.

(f) **Land has multiple uses:** and can be used for varied purposes, though its suitability in all the uses is not the same.

(g) **Land is heterogeneous:** No two pieces of land are alike. They differ in fertility and situation.

2. **Labour:**

- Labour involves various types of human efforts that require physical exertion, skill, and intellect, aimed at producing goods or services.
- Economic significance is attached to labour when it is performed with the motive of receiving economic rewards.
- Work done out of love or affection, despite its contribution to human well-being, is not considered labour in the economic sense.
- Services provided by a housewife are not considered labour, while those of a maid servant are regarded as labour.

Characterstics:

(a) **Human Effort:**

- Unlike other factors, labour is connected to human beings, which introduces human and psychological considerations.
- Factors such as leisure, fair treatment, and a favorable work environment become important for labourers.
- Providing leisure time allows for rest and personal fulfillment outside of work.
- Fair treatment ensures that labourers are treated justly and without discrimination.
- A favorable work environment promotes productivity, satisfaction, and overall well-being.

(b) **Labour is perishable:** Labour is highly 'perishable' in the sense that a day's labour lost cannot be completely recovered by extra work on any other day. In other words, a labourer cannot store his labour.

(c) **Labour is an active factor:** Without the active participation of labour, land and capital may not produce anything.

(d) **Labour is inseparable from the labourer:** A labourer is the source of his own labour power. When a labourer sells his service, he has to be physically present where they are delivered. The labourer sells his labour against wages, but retains the capacity to work.

(e) **Labour power differs from labourer to labourer:** Labour is heterogeneous in the sense that labour power differs from person to person. Labour power or efficiency of labour depends upon the labourers' inherent and acquired qualities, characteristics of work environment, and incentive to work.

(f) **All labour may not be productive:** (i.e.) all efforts are not sure to produce resources.

(g) **Labour has poor bargaining power:** Labour has a weak bargaining power. Labour has no reserve price. Since labour cannot be stored, the labourer is compelled to work at the wages offered by the employers. For this reason, when compared to employers, labourers have poor bargaining power and can be exploited and forced to accept lower wages.

(h) Labour is mobile: Labour is a mobile factor. Apparently, workers can move from one job to another or from one place to another. However, in reality there are many obstacles in the way of free movement of labour from job to job or from place to place.

(i) There is no rapid adjustment of supply of labour to the demand for it: The total supply of labour cannot be increased or decreased instantly.

(j) Choice between hours of labour and hours of leisure: A labourer can make a choice between the hours of labour and the hours of leisure. The supply of labour and wage rate is directly related. It implies that, as the wage rate increases the labourer tends to increase the supply of labour by reducing the hours of leisure. However, beyond a desired level of income, the labourer reduces the supply of labour and increases the hours of leisure in response to further rise in the wage rate. That is, he prefers to have more of rest and leisure than earning more money.

3. Capital:

- Capital is a part of the wealth of individuals or communities that is used for the purpose of producing more wealth.
- Capital is a stock concept, representing accumulated resources, while income generated from capital is a flow concept.
- Capital should be distinguished from general wealth, as only a portion of wealth can be classified as capital.
- Capital is defined as the "produced means of production" or "man-made instruments of production."
- It refers to man-made goods used in the production of additional wealth.
- Capital is distinct from land and labour, as land and labour are primary factors of production, while capital is a produced factor.
- Examples of capital include machine tools, factories, dams, canals, and transport equipment.
- Capital is created by human effort in collaboration with nature to aid in the production of goods and services.
- Capital is mobile, and can flow from one use to another, one country to another, etc. subject to certain restrictions.
- Unlike land, which is permanent and indestructible, capital is perishable. Once capital is utilized, it cannot be reverted back to its original form. Capital assets are subject to wear and tear, obsolescence, and depreciation over time

Types of Capital:

(a) Fixed capital is that which exists in a durable shape and renders a series of services over a period of time. For example tools, machines, etc.

(b) Circulating capital is another form of capital which performs its function in production in a single use and is not available for further use. For example, seeds, fuel, raw materials, etc.

(c) Real capital refers to physical goods such as building, plant, machines, etc.

(d) Human capital refers to human skill and ability. This is called human capital because a good deal of investment goes into creation of these abilities in humans.

(e) Tangible capital can be perceived by senses whereas intangible capital is in the form of certain rights and benefits which cannot be perceived by senses. For example, copyrights, goodwill, patent rights, etc.

(f) Individual capital is personal property owned by an individual or a group of individuals.

(g) Social Capital is what belongs to the society as a whole in the form of roads, bridges, etc.

Capital Formation:

- Capital formation refers to the process of increasing the stock of real capital in a country.
- It involves the production of capital goods such as machines, tools, factories, transportation equipment, and electricity, which are used for further production of goods.
- Capital formation is also known as investment.
- It is necessary for not only replacing and renovating existing capital goods but also for creating additional productive capacity.
- In order to accumulate capital goods, some current consumption needs to be sacrificed, and savings from current income are required.
- The willingness of people to abstain from present consumption determines the extent of savings and investment in new capital formation.
- If a society consumes all it produces and saves nothing, the future productive capacity of the economy will decline when the existing capital equipment wears out.
- It is advisable to reduce some present consumption and allocate a portion of it to the production of capital goods.
- A higher rate of capital formation leads to increased production, productive capacity, efficiency of production efforts, economic growth, and employment opportunities.

Stages of capital formation: There are mainly three stages of capital formation which are as follows:

(a) Savings:

- Savings play a crucial role in capital formation, as the ability to save is essential for individuals and the economy as a whole to accumulate capital.
- Higher incomes generally lead to higher savings because as income increases, the propensity to consume decreases and the propensity to save increases. This is true for both individual and the economy.
- The willingness to save is also important, which depends on an individual's concern for their future and the social environment they live in.
- Governments can encourage savings through policies such as making insurance and provident funds compulsory for employed individuals and offering tax deductions on saved income.

(b) Mobilization of Savings:

- Mobilization of savings is crucial for capital formation, and it involves ensuring that saved money enters circulation and contributes to the process of capital formation.

- The availability of appropriate financial products and institutions is necessary for the mobilization of savings. This includes a wide network of banks and financial institutions that can collect public savings and direct them to potential investors.
- The state plays a significant role in mobilizing savings by implementing fiscal and monetary incentives to generate savings. Additionally, the state can channelize savings towards priority needs of the community, promoting not only capital generation but also socially beneficial capital formation.

(c) Investment:

- Capital formation is completed when real savings are transformed into real capital assets.
- To achieve this, an economy needs an entrepreneurial class that is willing to take risks in business and invest savings in productive ventures.
- The entrepreneurial class plays a crucial role in utilizing savings to create new capital assets.
- This process involves identifying and investing in productive avenues that contribute to the expansion of the economy's capital stock.

4. Entrepreneur:

- The entrepreneur is the fourth factor of production, distinct from land, capital, and labor.
- The entrepreneur mobilizes the other factors, combines them in the right proportions, and initiates the production process.
- The entrepreneur is responsible for bearing the risks associated with the production process.
- While the tasks of organization and management have evolved and become separate roles, the entrepreneur's primary role is to initiate production and take on the risks involved.

Functions of an entrepreneur:

(a) Initiating business enterprise and resource co-ordination:

- An entrepreneur plays a crucial role in business by identifying opportunities, conceiving project ideas, and initiating a business enterprise.
- The entrepreneur organizes the necessary resources and coordinates factors of production such as land, labor, and capital to achieve higher productivity and yields.
- The entrepreneur hires and pays other factors of production, such as labor and capital, at predetermined rates.
- The entrepreneur's reward for their efforts and risk-taking is not fixed and can vary as profits or losses.
- While other factors of production receive their contractual payments regardless of profitability, the entrepreneur's profit is contingent on the success of the enterprise.

(b) Risk bearing or uncertainty bearing:

- The entrepreneur holds the ultimate responsibility for the success and survival of a business.

- The actual course of events may differ from what was planned and anticipated by the entrepreneur due to dynamic changes in the economy.
- The entrepreneur bears financial risks associated with unforeseen changes in cost and demand conditions, which may result in losses.
- Technological risks also arise as new inventions and improvements make existing techniques and machines obsolete, and the entrepreneur must assess and bear these risks.
- As per Frank Knight, Profit is considered the reward for bearing uncertainties that cannot be insured against, such as changes in tastes and emergence of competition.
- While other functions of an entrepreneur can be delegated to managers, risk bearing cannot be delegated, making it the most important function of an entrepreneur.

(c) Innovations:

- According to Schumpeter, the true function of an entrepreneur is to introduce innovations to better fulfill business requirements.
- Innovations include the introduction of new or improved products, devices, production processes, raw materials, technology, business models, and exploring new markets.
- The entrepreneur's task is to continuously introduce new innovations, which can enhance efficiency, competitiveness, and profitability.
- Successful innovations may initially yield profits, but as they are imitated by others, the profits tend to disappear over time.
- Entrepreneurs contribute to economic growth by introducing new innovations and promoting technological progress.
- Innovations involve risks, and only a few individuals in society possess the capability to introduce new innovations.
- The supply of entrepreneurs and the rate of technological progress are positively correlated, meaning that a higher level of innovating ability leads to a greater number of entrepreneurs and faster technological advancement.

ENTERPRISE'S OBJECTIVES AND CONSTRAINTS

The objectives of an enterprise may be broadly categorised under the following heads:

1. **Organic objectives:**
   - The basic objective of all enterprises is to survive, which means being able to produce and distribute products or services at a price that covers costs.
   - If an enterprise fails to recover its costs, it may face bankruptcy and be unable to meet its obligations to creditors, suppliers, and employees.
   - Once an enterprise ensures its survival, it aims for growth and expansion.
   - The rise of professional managers has made growth an important objective in corporate firms.

- R.L. Marris's theory suggests that managers aim to maximize the firm's balanced growth rate, considering managerial and financial constraints.
- Managers' utility function includes variables such as salary, power, status, and job security, while owners focus on profit, capital, market share, and public reputation.
- Despite some divergence and conflicts between these utility functions, Marris argues that the variables converge into a single variable, steady growth in the size of the firm.
- Managers prioritize optimization of the balanced rate of growth, which involves increasing demand for the firm's products and the supply of capital.

2. Economic objectives:

- The profit maximization assumption has been a fundamental concept in economics for over two hundred years and remains a cornerstone of neoclassical microeconomic theory.
- Under the profit maximization assumption, firms aim to determine the price and output policies that maximize profits within the constraints imposed by technology, finance, and other factors.
- Investors, creditors, and employees are interested in a profitable enterprise as it ensures fair dividends, stock price improvement, and creditworthiness.
- Economic profit, in contrast to accounting profit, considers both explicit and implicit costs, including opportunity costs associated with self-owned factors. Economic profit is generally lower than accounting profit.
- Normal profit represents the minimum necessary for a business to continue and includes a normal rate of return on capital, labor remuneration, and the reward for risk-bearing by the entrepreneur.
- Critics argue that not all firms aim to maximize profits, as some prioritize security, satisfactory profits, or sales revenue maximization. Discretionary powers of managers in large corporations can influence goals beyond profit maximization, such as utility maximization or a combination of profits and other objectives.
- Managers' utility functions may incorporate goals like maintaining lavish offices, promoting sales, and increasing market share, in addition to profit objectives. Cyert and March suggest additional functional goals for firms, including production, inventory, sales, and market share goals.

3. Social objectives:

- An enterprise exists within a society and must fulfill the needs of that society in order to grow.
- Important social objectives of businesses include maintaining a continuous and sufficient supply of unadulterated goods of standard quality, avoiding profiteering and anti-social practices, creating opportunities for gainful employment, and ensuring that the enterprise's output does not cause pollution.
- Failure to fulfill these social objectives may hinder the long-term survival of the enterprise.

4. Human objectives:

- Human beings are the most valuable resources of an organization, and their comprehensive development should be a major objective.

- Important human objectives for an organization include providing fair treatment to employees at different levels, developing their skills and abilities, and creating a work climate that promotes personal and professional growth.
- Employees should be given opportunities to participate in decision-making processes that affect them.
- Making job contents interesting and challenging can enhance employee satisfaction and productivity.
- When an enterprise fulfills its responsibilities towards its employees, it can secure their loyalty and support.

5. **National objectives:** An enterprise should endeavour for fulfilment of national needs and aspirations and work towards implementation of national plans and policies. Some of the national objectives are:
   - To remove inequality of opportunities and provide fair opportunity to all to work and to progress.
   - To produce according to national priorities.
   - To help the country become self-reliant and avoid dependence on other nations.
   - To train young men as apprentices and thus contribute in skill formation for economic growth and development.

An enterprise's actions may get constrained by many factors. Important among them are

1. **Lack of knowledge and information:**
   - The enterprise operates in an uncertain environment where accurate information may be lacking.
   - Due to this lack of knowledge and information, variables that impact the firm's performance cannot be accurately predicted, not just for the current period but also for the future.
   - Uncertainty and incomplete information pose difficulties for decision-making and profit optimization in the business environment.
2. There may be infrastructural inadequacies and consequent supply chain bottlenecks resulting in shortages and unanticipated emergencies. For example, there could be frequent power cuts, irregular supply of raw-materials or non-availability of proper transport. This could put limitations on the power of enterprises to maximise profits.
3. Changes in business and economic conditions, as well as external factors like government policies and natural calamities, can have significant impacts on firms. These factors create demand fluctuations, instability in sales and revenues, and place constraints on firms' operations. Unexpected changes in policies or fiscal limitations can adversely affect profitability and growth plans.
4. Events such as inflation, rising interest rates, unfavourable exchange rate fluctuations cause increased raw material, capital and labour costs and affect the budgets and financial plans of firms.
5. Significant constraints are also imposed by the inability of firms to find skilled workforce at competitive wages as well as due to the recurring need for personnel training.

ENTERPRISE'S PROBLEMS

Some major areas of problems in the context of Business Economics are given below–

1. **Problems relating to objectives:**
   - An enterprise operates within a complex environment encompassing economic, social, political, and cultural factors.
   - Setting objectives in relation to this environment is crucial, but often these objectives can be multifaceted and conflicting.
   - For instance, the objective of maximizing profits may conflict with the objective of increasing market share, which requires quality improvements and price reductions.
   - Therefore, enterprises face the challenge of not only choosing their objectives but also finding a balance among them.
2. **Problems relating to location and size of the plant:**
   - An enterprise must decide on the location of its plant, considering factors such as proximity to raw material sources and the market, labor costs, facilities, and transportation costs.
   - The entrepreneur needs to weigh these relevant factors against each other to determine the most economical location.
   - The size of the firm is another consideration, whether it should be a small-scale unit or a large-scale unit.
   - Technical, managerial, marketing, and financial aspects of the proposed business must be carefully evaluated when deciding on the scale of operations.
   - The management should realistically assess its strengths and limitations before determining the size of the new unit.
3. **Problems relating to selecting and organising physical facilities:**
   - A firm must decide on the nature of the production process and the type of equipment to be used.
   - The choice of process and equipment depends on the chosen design and the required volume of production.
   - Large-scale production typically involves the use of specialized and complicated machinery and processes.
   - The entrepreneur may have to choose from various types of equipment and production processes, considering their relative cost and efficiency.
   - Once the equipment and processes are determined, the entrepreneur will prepare a layout that illustrates the arrangement of equipment, buildings, and activity allocation.
4. **Problems relating to Finance:** An enterprise has to undertake not only physical planning but also expert financial planning. Financial planning involves
   - Determination of the amount of funds required for the enterprise with reference to the physical plans already prepared
   - Assessment of demand and cost of its products
   - Estimation of profits on investment and comparison with the profits of comparable existing concerns to find out whether the proposed investment will be profitable enough and

- Determining capital structure and the appropriate time for financing the enterprise etc.

5. **Problems relating to organisation structure:**
   - An enterprise encounters challenges regarding its organizational structure.
   - It needs to divide the overall work of the enterprise into major specialized functions and establish appropriate departments for each function.
   - Clear roles and responsibilities should be defined for all positions and levels within the organization.
   - The inter-relationships between positions, in terms of span of control, authority, responsibility, etc., need to be properly defined.
   - Efficient functioning of the enterprise relies on having clearly defined roles and relationships within the organizational structure.
6. **Problems relating to marketing:**
   - Proper marketing of its products and services is essential for the survival and growth of an enterprise.
   - The enterprise has to discover its target market by identifying its actual and potential customers
   - Determine tactical marketing tools it can use to produce desired responses from its target market.
   - The enterprise has to make decision regarding 4 P's namely:
     (a) **Product:** variety, quality, design, features, brand name, packaging, associated services, utility etc.
     (b) **Promotion:** Methods of communicating with consumers through personal selling, social contacts, advertising, publicity etc.
     (c) **Price:** Policies regarding pricing, discounts, allowance, credit terms, concessions, etc.
     (d) **Place:** Policy regarding coverage, outlets for sales, channels of distribution, location and layout of stores, inventory, logistics etc
7. **Problems relating to legal formalities:**
   - Launching and operating an enterprise involves various legal formalities.
   - These formalities include assessing and paying different types of taxes such as corporate tax, excise duty, sales tax, and custom duty.
   - Maintaining records and submitting required information to relevant authorities is necessary.
   - Adhering to government rules and laws is essential, such as those related to location, environmental protection, pollution control, size regulations, wages and bonus, corporate management licensing, and price regulations.
   - Compliance with legal formalities is crucial for the smooth operation of the enterprise and to avoid legal complications.
8. **Problems relating to industrial relations:**
   - With the rise of the factory system, management faces challenges in establishing effective industrial relations.

- Misunderstandings and conflicts of interest have become more complex and difficult to address.
- Key problems in industrial relations include winning workers' cooperation, enforcing discipline, dealing with organized labor, and establishing a democratic environment by involving workers in industry management.
- Industrial relations have become more involved and require special measures to address the complexities of worker-management relationships.

TRY YOUR UNDERSTANDING 3.1.1

1. In Economics, entire process of services _____ is nothing but creation of utilities in the form of goods & services.
   (a) Consumption (b) Production (c) Exchange (d) Distribution
2. Production is defined as:
   (a) Creation of matter
   (b) Creation of utility in matter
   (c) Creation of infrastructural facilities
   (d) None of the above
3. According to _____ Production is the organized activity of transforming resources into finished products in the form of goods and services, and the objective of production is to satisfy the demand of such transformed "resources".
   (a) James Bates (b) J.R. Parkinson
   (c) Marshall (d) Both (a) and (b)
4. _____ to exchange in the market is an essential component of production.
   (a) Intention (b) Ability (c) Capacity (d) Possibility
5. Which of the following is not a characteristics of Land?
   (a) It is a free gift of nature (b) It is a mobile factor of production
   (c) It is limited in quantity (d) Its productive power is indestruc-tible
6. Which among the following is not a characteristic of land?
   (a) It is an active factor
   (b) It has variety of uses
   (c) Its production powers are inde-structible
   (d) Its supply is limited
7. Which of the following is not a characteristic of labour?
   (a) It is perishable
   (b) It has weak bargaining power
   (c) Labour and Labour power cannot be separated
   (d) Labour is not mobile

8. The labour power or efficiency of labour depends upon the _____
   (a) Laborer's inherent and acquired qualities.
   (b) Features of work environment
   (c) Incentive to work
   (d) All of the above.

9. _____ Capital performs its function is production in a single use and is not available for future use
   (a) Circulating (b) Fixed (c) Tangible (d) Human

10. Which one of the following may be regarded as a part of social capital?
   (a) Roads (b) Bridges (c) Machinery (d) Both (a) & (b)

11. The three stages of capital forma-tion are:
   (a) Savings, Mobilization of Savings and investment
   (b) Mobilization of Saving, Savings, and investment
   (c) Investment, Saving and mobiliza-tion of Saving
   (d) Saving, Investment and mobiliza-tion of savings.

12. _____ means a sustained increase in the stock of real capital in a Country.
   (a) Capital formation (b) Savings
   (c) Mobilization of Savings (d) Mobilization of Capital

13. An Entrepreneur undertakes which one of the following functions?
   (a) Initiating a business and resource co-ordination
   (b) Risk or uncertainty bearing
   (c) Innovations
   (d) All of the above

14. Innovation theory of entrepreneur-ship is propounded by:
   (a) Knight (b) Schumpeter (c) Max Weber (d) Peter Drucker

15. Which one of the following function is performed by entrepreneur?
   (a) Initiating Business Enterprise and resource Co-ordination
   (b) Risk-bearing or uncertainty bear¬ing
   (c) Innovations
   (d) All of the above.

Answer Key

1. (b) 2. (b) 3. (d) 4. (a) 5. (b) 6. (a) 7. (d) 8. (d) 9. (a) 10. (d)
11. (a) 12. (a) 13. (d) 14. (b) 15. (d)

PRODUCTION FUNCTION

- The production function is a statement of the relationship between a firm's scarce resources (i.e. its inputs) and the output that results from the use of these resources.

- It states technological relationship between inputs and output.
- The production function can be algebraically expressed in the form of an equation in which the output is the dependent variable and inputs are the independent variables.
- The equation can be expressed as: Q = f (a, b, c, d .....n)

  Where 'Q' stands for the rate of output of given commodity and a, b, c, d.....n, are the different factors (inputs) and services used per unit of time.
- For the purpose of analysis, the whole array of inputs in the production function can be reduced to two; L and K.

  Restating the equation given above, we get:

  Q = f(L, K).

  Where, Q = Output

  L = Labour

  K = Capital

ASSUMPTIONS OF PRODUCTION FUNCTION

There are three main assumptions:

1. The relationship between inputs and outputs exists for a specific period of time.
2. There are no significant changes in the state of technology during the given period of time.
3. The output achieved by utilizing any combination of inputs in a specific function is maximized.

SHORT-RUN VS LONG-RUN PRODUCTION FUNCTION

- The production function of a firm can be studied in the context of short period or long period.
- In economic analysis, the distinction between short-run and long-run is not related to any particular measurement of time (e.g. days, months, or years).
- **Short Run Production Function:**
  - A period will be considered short-run period if the amount of at least one of the inputs used remains unchanged during that period.
  - Short-run production function shows the maximum amount of a good or service that can be produced by a set of inputs, assuming that the amount of at least one of the inputs used remains fixed (or unchanged).
  - In the short-run, the production function is studied by holding the quantities of capital fixed, while varying the amount of other factors (labour, raw material etc.) This is done when the law of variable proportion is studied.
- **Long Run Production Function:**
  - The long run is a period of time (or planning horizon) in which all factors of production are variable.
  - It is a time period when the firm will be able to install new machines and capital equipments apart from increasing the variable factors of production.

- A long-run production function shows the maximum quantity of a good or service that can be produced by a set of inputs, assuming that the firm is free to vary the amount of all the inputs being used.
- The behaviour of production when all factors are varied is the subject matter of the law of returns to scale.

COBB-DOUGLAS PRODUCTION FUNCTION

- A famous statistical production function is Cobb-Douglas production function.
- Paul H. Douglas and C.W. Cobb of the U.S.A. studied the production function of the American manufacturing industries.
- In its original form, this production function applies not to an individual firm but to the whole of manufacturing in the United States.
- In this case, output is manufacturing production and inputs used are labour and capital
- Cobb-Douglas production function is stated as: $Q = KL^a C^{(1-a)}$

  where 'Q' is output, 'L' the quantity of labour and 'C' the quantity of capital. 'K' and 'a' are positive constants.
- The conclusion drawn from this famous statistical study is that labour contributed about 3/4th and capital about 1/4th of the increase in the manufacturing production.

CONCEPT OF PRODUCT

The term "product" or "output" refers to the quantity of goods manufactured by a company or an industry within specified time period.

1. **Total Product:**
   - Total product refers to the overall quantity of goods produced by a company within a specific time period, using a given number of inputs.
   - For instance, if 10 workers produce 80 kg of wheat, the total product would be 80 kg.
   - In the short-run, a firm can increase total product by increasing only the variable factors.
   - While in the long-run, both fixed and variable factors can be increased to raise total product.
   - Total product is also referred to as "Total Physical Product (TPP)," "Total Return," or "Total Output."
2. **Average Product (AP):**
   - Average product refers to output per unit of variable input.
   - For instance, if total product (TP) is 80 kg of wheat, produced by 10 workers, then AP will be 80 Kg / 10 Workers = 8 Kg
   - AP is obtained by dividing TP by units of variable factor.

     $$\text{Average Product (AP)} = \frac{\text{Total Product}}{\text{Variable Input}}$$
   - TP can be derived from AP: TP = AP × Units of Variable Factor
   - Average Product is also known as 'Average Physical Product (APP)' or 'Average Return.'

3. Marginal Product:

- Marginal product is the change in total product, when additional unit of variable factor is introduced or employed.
- In other words, it is the addition made to the total production by an additional unit of input.
- Marginal Product (MP) is also known as 'Marginal Physical Product (MPP)' or 'Marginal Return'.

  i.e., $MP_n = TP_n - TP_{n-1}$

  For example, If 10 labours make 80 kg of wheat and 11 labours make 87 kg of wheat, then MP of 11th labour will be:

  $MP_{11} = TP_{11} - TP_{10}$

  $MP_{11} = 87 - 80 = 7$ kg
- When more than one variable factor is introduced, then MP can be calculated as:

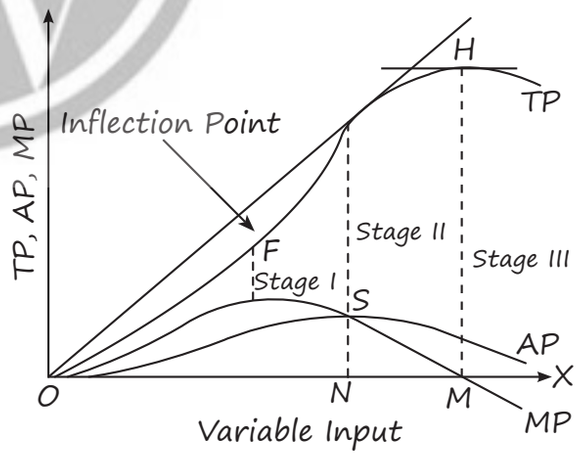
  $$MP = \frac{\text{Change in Total Product}}{\text{Change in Veriable Input}}$$

  For example, 2 labours produce 30 units and 5 labours produce 66 units, then MP will be:

  $$MP = \frac{66 - 30}{5 - 2} = 12 \text{ units}$$
- Total Product is the sum of marginal product.

  i.e., $TP = \Sigma MP$

Labour	TP	MP	AP	
1	10	10	10	Increasing Returns
2	22	12	11	
3	36	14	12	
4	48	12	12	
5	56	8	11.2	Diminishing Returns
6	62	6	10.33	
7	65	3	9.29	
8	65	0	8.125	
9	63	-2	7	Negative Returns
10	58	-5	5.8	



THE LAW OF VARIABLE PROPORTIONS OR THE LAW OF DIMINISHING RETURNS

- Examines the production function with one factor variable, keeping quantities of other factors fixed.

- It refers to input-output relationship, when the output is increased by varying the quantity of one input.
- This law operates in the short run 'when all factors of production cannot be increased or decreased simultaneously
- The law operates under certain **assumptions** which are as follows:
  (a) The state of technology is assumed to be given and unchanged. If there is any improvement in technology, then marginal product and average product may rise instead of falling.
  (b) It is assumed that all variable factors are equally efficient.
  (c) There must be some inputs whose quantity is kept fixed. This law does not apply to cases when all factors are proportionately varied. When all the factors are proportionately varied, laws of returns to scale are applicable.
  (d) We consider only physical inputs and outputs and not economic profitability in monetary terms.
- The behaviour of output when the varying quantity of one factor is combined with a fixed quantity of the others can be divided into three distinct stages or laws.

STAGE 1: THE STAGE OF INCREASING RETURNS

- In this stage, the total product increases at an increasing rate, marginal product also rises and is maximum at the point corresponding to the point of inflexion and average product goes on rising.
- After Inflexion Point, the total product goes on rising but at a diminishing rate. Marginal product falls but is positive. The stage 1 ends where the AP curve reaches its highest point.
- In the first stage, the AP curve rises throughout whereas the marginal product curve first rises and then starts falling after reaching its maximum.

Explanation of Stage 1

1. **Enhanced Utilization of the Fixed Factor:** Initially, there is an abundance of the fixed factor (such as land) and a scarcity of variable factors. As a result, the fixed factor is underutilized. However, by increasing the variable factors and combining them with the fixed factor, the fixed factor is utilized more efficiently, leading to an increasing rate of output.
2. **Improved Efficiency of Variable Factors:** Increasing the variable factors and combining them with the fixed factor allows for a more efficient utilization of the variable factors. This leads to greater cooperation and specialization among different units of the variable factor.
3. **Indivisibility of Fixed Factors:** Typically, the fixed factors combined with variable factors are indivisible, meaning they cannot be divided into smaller units. Once an investment is made in an indivisible fixed factor, adding more units of the variable factor improves the utilization of the fixed factor. Increasing returns continue as long as the optimal combination between the variable and fixed factors is achieved.

STAGE 2: STAGE OF DIMINISHING RETURNS

- In stage 2, the total product continues to increase at a diminishing rate until it reaches its maximum leve.
- In this stage, both marginal product and average product of the variable factor are diminishing but are positive.
- At the end of this stage the marginal product of the variable factor is zero corresponding to maximum TP.
- Stage 2, is known as the stage of diminishing returns because both the average and marginal products of the variable factors continuously fall during this stage.
- This stage is very important because the firm will seek to produce within its range.

Explanation of Stage 2

1. **Optimal Combination of Factors:** Among the various combinations of fixed and variable factors, there exists an optimal combination that maximizes the total product (TP). Once the fixed factor is utilized optimally, the marginal return of the variable factor starts to diminish. For instance, if a machinery (fixed factor) is utilized optimally with 4 laborers, adding one more laborer will result in a minimal increase in TP, and the marginal product (MP) will begin to decrease.
2. **Imperfect Substitutes:** Diminishing returns to a factor arise because fixed and variable factors are imperfect substitutes for each other. There is a limit to which one factor of production can be substituted for another. For example, labor can be substituted for capital or vice versa up to a certain extent. However, beyond the optimal limit, they become imperfect substitutes, leading to diminishing returns.

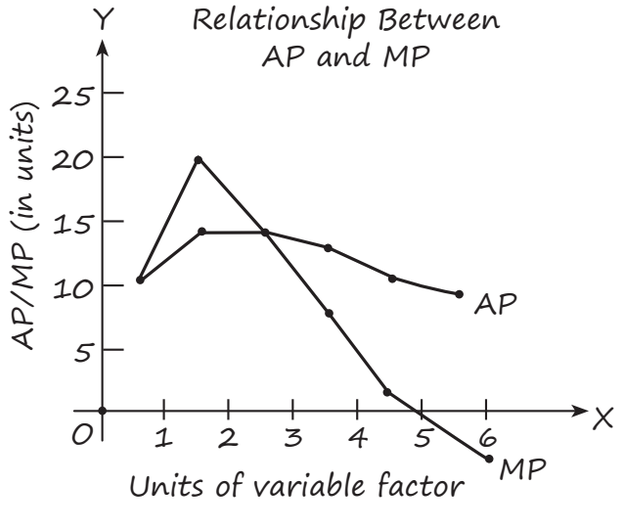
STAGE 3: STAGE OF NEGATIVE RETURNS:

- In Stage 3, total product declines, MP is negative, average product is diminishing.
- This stage is called the stage of negative returns since the marginal product of the variable factor is negative during this stage.

Explanation of Stage 3

1. **Constraints of Fixed Factors:** Negative returns occur because certain factors of production are fixed in nature and cannot be increased in the short run, limiting the overall output even with an increase in the variable factor.
2. **Lack of Coordination between Fixed and Variable Factors:** When the variable factor becomes excessively abundant in relation to the fixed factor, they begin to hinder each other, resulting in poor coordination. This leads to a decrease in total output instead of an increase, with the marginal product eventually becoming negative.
3. **Decline in Efficiency of the Variable Factor:** As the variable factor is continuously increased, the benefits of specialization and division of labor start diminishing. This inefficiency in the variable factor further contributes to the occurrence of negative returns.

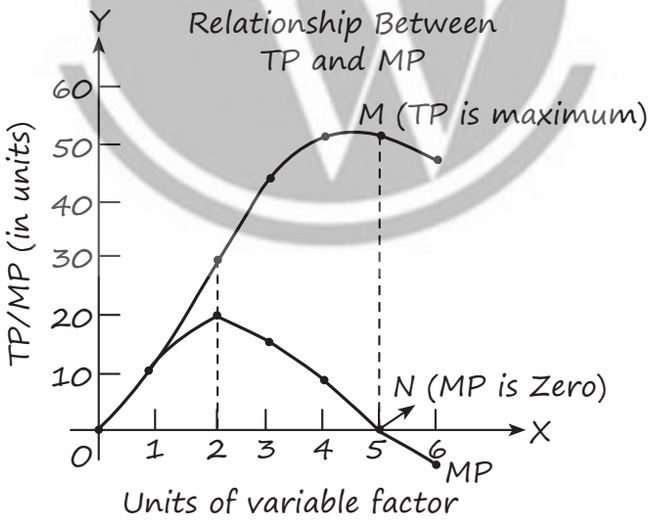
Relationship Between AP & MP



The relationship between average product and marginal product can be summed up as follows:

1. When average product rises as a result of an increase in the quantity of variable input, marginal product is more than the average product.
2. When average product is maximum, marginal product is equal to average product. In other words, the marginal product curve cuts the average product curve at its maximum.
3. When average product falls, marginal product is less than the average product.

Relationship Between TP & MP



1. Initially, as more units of the variable factor are added, both TP and MP increase.
2. TP continues to rise at a diminishing rate, indicating diminishing returns to the variable factor.
3. At the point of maximum TP, the MP becomes zero, indicating that the variable factor no longer adds to the total output.
4. Beyond the point of maximum TP, TP starts to decrease, and MP becomes negative, implying that each additional unit of the variable factor reduces the total output.

Stage of Operation

A rational producer aims to operate in Phase II of the Law of Variable Proportions for several reasons:

1. **Phase I:** In this phase, the employment of each additional unit of the variable factor results in an increasing marginal product, indicating the potential for higher profits. The producer can benefit from increasing production by utilizing more units of the variable factor.
2. **Phase III:** In this phase, the marginal product of each variable factor becomes negative, indicating technical inefficiency. As a result, rational producers avoid operating in Phase III due to the diminishing returns and reduced profitability associated with it.

Hence, the rational choice for a producer is to operate in Phase II, where the total product (TP) is at its maximum and the marginal product of each variable factor remains positive. Operating in Phase II allows the producer to maximize output and maintain a favorable production level for optimal profitability.

TRY YOUR UNDERSTANDING 3.1.2

1. A production function is defined as the relationship between _____.
   (a) The quantity of physical inputs and physical output of a firm
   (b) Stock of inputs and stock of output
   (c) Prices of inputs and output
   (d) Price and supply of a firm
2. The production function:
   (a) Is the relationship between the quantity of inputs used and the resulting quantity of product.
   (b) Tells us the maximum attainable output from a given combination of inputs.
   (c) Expresses the technological relationship between inputs and output of a product.
   (d) All the above.
3. Long period production function is related to:
   (a) Law of variable proportions (b) Laws of returns to scale
   (c) Law of diminishing returns (d) None of the above
4. In its original form, the Cobb- Douglas production function applies:
   (a) To individual firm
   (b) To selected Firms
   (c) To whole of manufacturing in the USA
   (d) None of the above.
5. In Cobb-Douglas production function, two inputs are:
   (a) Land and Labour (b) Labour and Capital
   (c) Capital and Entrepreneur (d) Entrepreneur and land
6. If Cobb-Douglas function is given by Q = KLaCb, then there will be _____ when (a+b) _____.

(a) Increasing returns, > 1 (b) Increasing returns to scale, > 1
(c) Diminishing returns, < 1 (d) Decreasing returns to scale, = 1

7. The conclusion drawn from Cobb-Douglas production function is that labour contributed about _____ and capital about _____ of the increase in the manufacturing production.
(a) $\frac{3^{rd}}{4}, \frac{1^{st}}{4}$ (b) $\frac{1}{2}, \frac{1}{2}$ (c) $\frac{1^{th}}{4}, \frac{3^{rd}}{4}$ (d) None of the above

8. Average product is defined as
(a) Total product divided by the total cost.
(b) Total product divided by marginal product.
(c) Total product divided by the number of units of variable input.
(d) Marginal product divided by the number of units of variable input.

9. Suppose the first four units of a variable input generate corresponding total outputs of 200, 350, 450, 500. The marginal product of the third unit of input is:
(a) 50 (b) 100 (c) 150 (d) 200

10. Marginal product, mathematically, is the slope of the
(a) Total product curve. (b) Average product curve.
(c) Marginal product curve. (d) Implicit product curve.

11. Which of the following is correct.
(a) MPn = TPn – TPn–1 (b) MPn = MPn – MPn–1
(c) MPn = TPn + TPn–1 (d) None of the above

12. The average product of labour is maximized when marginal product of labour:
(a) Equals the average product of labour.
(b) Equals zero.
(c) Is maximized.
(d) None of the above

13. The Law of Variable Proportions is associated with:
(a) Short period (b) Long period
(c) Both short and long periods (d) Neither short nor long period

14. During 2nd stage of law of Dimin-ishing returns:
(a) MP and TP is maximum (b) MP and AP are decreasing
(c) AP is negative (d) TP is negative

15. A rational producer will produce in the stage in which marginal product is positive and:
(a) MP> AP (b) MP = AP (c) MP < AP (d) MP is zero

Answer Key

1. (a) **2.** (d) **3.** (b) **4.** (c) **5.** (b) **6.** (b) **7.** (b) **8.** (c) **9.** (b) **10.** (a)
11. (a) **12.** (a) **13.** (a) **14.** (b) **15.** (c)

❑❑❑

UNIT

2

Theory of Cost

- **Cost:** It refers to the expenditure incurred in the production of a commodity. For example: purchase of raw material, wages and salary, rent, interest etc.
- **Type of Costs:** Cost is classified on the basis of following types:
  1. Explicit cost and Implicit cost
  2. Accounting Costs and Economic costs
  3. Outlay costs and Opportunity costs
  4. Direct or Traceable costs and Indirect or Non-Traceable costs
  5. Incremental costs and Sunk costs
  6. Historical costs and Replacement costs
  7. Private costs and Social costs
  8. Fixed and Variable costs

1. Explicit cost and Implicit cost:

Explicit cost	Implicit cost
Costs which involve payment made by the Entrepreneur to providers of other factors of production, i.e. Land, Labour and Capital,	Costs which do not involve any cash payment to outsiders are called Implicit Costs. It is the monetary reward for all factor of production owned by entrepreneur himself
Recorded in books of accounts.	Not recorded in books of account.
Rent, Wages & Salaries, Interest on Loans borrowed for business, etc.	Interest on own Capital, Rent of own premises, Salary to Entrepreneur, etc.
Out—of—Pocket Costs / Outlay Costs.	Notional / Imputed / Opportunity Costs.

2. Accounting Costs and Economic Costs:

Accounting Costs

Also known as explicit costs

- **Meaning:**
  - Accounting costs relate to those costs which involve cash payments by the entrepreneur of the firm.
  - Accountants record these in the financial statements of the firm.
- **Example:**
  - wages to workers
  - prices for the raw materials

- fuel and power used,
- rent for the building
- interest on the money borrowed etc.

- **Economic costs:**

  Economic cost include both accounting costs and implicit costs.

  Therefore, economic costs are useful for businessmen while making decisions.

- **Economic costs include:**

  The normal return on money capital invested by the entrepreneur himself in his own business;

  The wages or salary not paid to the entrepreneur, but could have been earned if the services had been sold somewhere else.

Important Points

- Accounting costs do not include Economic cost
- The concept of economic cost is important because an entrepreneur must cover his economic cost if he wants to earn normal profits.
- Normal profit is part of implicit costs.
- If the total revenue received by an entrepreneur just covers both implicit and explicit costs, then he has zero economic profits.
- Super normal profits or positive economic profits (abnormal profits) are over and above these normal profits. In other words, an entrepreneur is said to be earning positive economic profits (abnormal profits) only when his revenues are greater than the sum of his explicit costs and implicit costs.

3. Outlay costs and Opportunity costs

- **Outlay costs:**
  - Outlay costs involve actual expenditure of funds on, say, wages, materials, rent, interest, etc.
  - Outlay costs involve financial expenditure at some point of time and hence are recorded in the books of account.
- **Opportunity costs:**
  - Opportunity cost is concerned with the cost of the next best alternative opportunity which was foregone in order to pursue a certain action.
  - It is the cost of the missed opportunity and involves a comparison between the policy that was chosen and the policy that was rejected.
  - For example, the opportunity cost of using capital is the interest that it can earn in the next best use with equal risk.
  - Opportunity cost is the amount or subjective value that is foregone in choosing one activity over the next best alternative. It relates to sacrificed alternatives; it is, in general not recorded in the books of account.
  - The opportunity cost concept is generally very useful for business managers and therefore it has to be considered whenever resources are scarce and a decision involving choice of one option over other(s) is involved. e.g., in a cloth mill which

spins its own yarn, the opportunity cost of yarn to the weaving department is the price at which the yarn could be sold. This has to be considered while measuring profitability of the weaving operations.

- In long-term cost calculations also opportunity cost is a useful concept e.g., while calculating the cost of higher education, it is not the tuition fee and cost of books alone that are relevant. One should also take into account the earnings foregone, other foregone uses of money which is paid as tuition fees and the value of missed activities etc. as the cost of attending classes.

4. Direct or Traceable costs and Indirect or Non-Traceable costs:

Basis	Direct cost or Traceable cost	Indirect cost or Non-traceable cost
Meaning	Direct costs are those which have direct relationship with a component of operationlike manufacturing a product, organizing a process or an activity etc.	Indirect costs are those which are not easily and definitely identifiable relation to a plant, product, process or department. Therefore, such costs are not visibly traceable to specific goods, services, operations, etc.; but are nevertheless charged to different jobs or products in standard accounting practice.
Example	Cost of Raw Material used in manufacture, Wages paid to Worker	Factory Rent, Electric Power, and other Common Costs incurred for general operation of business benefiting all products jointly.
Relationship	They can be generally quantified and expressed per unit of output, e.g. 5 kg of Raw Materials per unit of product, etc.	Though not quantifiable, they may bear some functional relationship to production, may vary with the volume of output in some definite way.
Accounting	They are charged directly to product.	Apportioned on suitable basis.

5. Incremental costs and Sunk costs:

- **Incremental costs:**
  - Incremental costs are related to the concept of marginal cost.
  - Incremental cost refers to the additional cost incurred by a firm as result of a business decision.
  - For example, incremental costs will have to be incurred by a firm when it makes a decision to change its product line, replace worn out machinery, buy a new production facility or acquire a new set of clients.
- **Sunk costs:**
  - Sunk costs refer to those costs which are already incurred once and for all and cannot be recovered.

- They are based on past commitments and cannot be revised or reversed if the firm wishes to do so.
- Examples of sunk costs are expenses incurred on advertising, R& D, specialised equipments and fixed facilities such as railway lines.
- Sunk costs act as an important barrier to entry of firms into business.

6. Historical costs and Replacement costs:

- **Historical costs:** Historical cost refers to the cost incurred in the past on the acquisition of a productive asset such as machinery, building etc.
- **Replacement costs:**
  - Replacement cost is the money expenditure that has to be incurred for replacing an old asset.
  - Instability in prices make these two cost (historical and replacement) differ. Other things remaining the same, an increase in price will make replacement costs higher than historical cost.

7. Private costs and Social costs:

- **Private costs:**
  - Private costs are costs actually incurred or provided for by firms and are either explicit or implicit.
  - They normally figure in business decisions as they form part of total cost and are internalised by the firm.
- **Social costs:**
  - Social cost, means total cost borne by the society on account of a business activity and includes private cost and external cost.
  - It includes the cost of resources for which the firm is not required to pay price such as atmosphere, rivers, roadways etc. and the cost in terms of dis-utility created such as air, water and environment pollution.

8. Fixed and Variable costs:

- **Fixed cost:**
  - Fixed or constant costs are not a function of output;
  - They do not vary with output upto a certain level of activity.
  - These costs require a fixed expenditure of funds irrespective of the level of output,
  - e.g., rent, property taxes, interest on loans and depreciation when taken as a function of time and not of output.
  - However, these costs vary with the size of the plant and are a function of capacity. Therefore, fixed costs do not vary with the volume of output within a capacity level.
- **Variable costs:**
  - Variable costs are costs that are a function of output

    For example,
    - wages of casual labourers
    - cost of raw materials

- Variable costs vary directly and sometimes proportionately with output.
- Over certain ranges of production, they may vary less or more than proportionately depending on the utilization of fixed facilities and resources during the production process.

TRY YOUR UNDERSTANDING 3.2.1

1. Economic cost excludes which of the following:
   (a) Accounting cost + explicit cost (b) Accounting cost + implicit cost
   (c) Explicit cost + Implicit cost (d) Accounting cost + opportunity cost
2. The cost of resources owned and employed by the entrepreneur himself in his business is termed as _____ cost.
   (a) Explicit (b) Implicit (c) Fixed (d) Variable
3. Which of the following is an example of an "implicit cost"?
   (a) Interest that could have been earned on retained earnings used by the firm to finance expansion.
   (b) The payment of rent by the firm for the building in which it is housed.
   (c) The interest payment made by the firm for funds borrowed from a bank.
   (d) The Payment of wages by the firm.
4. Opportunity cost is:
   (a) Direct cost (b) Total cost
   (c) Accounting cost (d) Cost of forgone opportunity
5. The cost of one thing in terms of alternative given up is known as:
   (a) Opportunity Cost (b) Real Cost
   (c) Production Cost (d) Physical Cost
6. Direct Cost is also known as:
   (a) Indirect Cost (b) Traceable Cost
   (c) Opportunity Cost (d) Accounting Cost.
7. _____ costs are the costs that are readily identified and are traceable to a particular product, operations or plant.
   (a) Direct Cost (b) Traceable Cost
   (c) Indirect Cost (d) Both (a) & (b)
8. Identify the indirect Cost.
   (a) Common cost incurred for general operations
   (b) Wages paid to worker
   (c) Material Purchased
   (d) Commission Paid
9. Theoretically, incremental costs are related to the concept of _____.
   (a) Marginal Cost (b) Fixed Cost
   (c) Judgmental Cost (d) Semi Variable Cost.

10. _____ refer to those costs which are already incurred once and for all and cannot be recovered.
    (a) Sunk Cost (b) Fixed Cost (c) Variable Cost (d) Incremental

11. Which one of the following is an example of Sunk Cost?
    (a) Expenses on advertising
    (b) Research & Development Expenditure
    (c) Specialized equipment & fixed facilities
    (d) All of these.

12. A Company is willing to change its existing Machinery (5 years old) by a new machinery at a cost of ₹10,00,000. The cost of ₹10,00,000 may be regarded as:
    (a) Historical Cost (b) Replacement Cost
    (c) New Cost (d) Market Cost

13. Other things remaining the same, an increase in price will make _____ cost higher than _____ cost.
    (a) Historical, Replacement (b) Replacement, Historical
    (c) Historical, reliable (d) Fixed, Historical.

Answer Key									
1. (a)	2. (b)	3. (b)	4. (d)	5. (a)	6. (b)	7. (d)	8. (a)	9. (a)	10. (a)
11. (d)	12. (b)	13. (b)							

COST FUNCTION

- Cost function refers to the mathematical relation between cost of a product and the various determinants of costs.
- Cost function is a function which is obtained from production function and the market supply of inputs.
- It expresses the relationship between costs and output.
- The shape of the cost curves depends upon the cost function.
- Cost functions are of two kinds:
  - Short-run cost functions
  - Long-run cost functions.

TOTAL, FIXED AND VARIABLE COSTS:

- There are some factors which can be easily adjusted with changes in the level of output. A firm can readily employ more workers if it has to increase output. Similarly, it can purchase more raw materials if it has to expand production. Such factors which can be easily varied with a change in the level of output are called variable factors. On the other hand, there are some factors such as building, capital equipment, or top management team which cannot be so easily varied. It requires comparatively longer time to make changes in them. It takes time to install new machinery. Similarly, it takes time to build a new factory. Such factors which cannot be readily varied and require a longer period to adjust are called fixed factors.

- Corresponding to the distinction between variable and fixed factors, we distinguish between short run and long run periods of time. Short run is a period of time in which output can be increased or decreased by changing only the amount of variable factors such as, labour, raw materials, etc. In the short run, quantities of fixed factors cannot be varied in accordance with changes in output. If the firm wants to increase output in the short run, it can do so only by increasing the variable factors, i.e., by using more labour and/or by buying more raw materials. Thus, short run is a period of time in which only variable factors can be varied, while the quantities of fixed factors remain unaltered. On the other hand, long run is a period of time in which the quantities of all factors may be varied. In other words, all factors become variable in the long run.
- Thus, we find that fixed costs are those costs which are independent of output, i.e., they do not change with changes in output. These costs are a "fixed amount" which are incurred by a firm in the short run, whether the output is small or large. Even if the firm closes down for some time in the short run but remains in business, these costs have to be borne by it. Fixed costs include such charges as contractual rent, insurance fee, maintenance cost, property taxes, interest on capital employed, managers' salary, watchman's wages etc. The fixed cost curve is presented in figure.

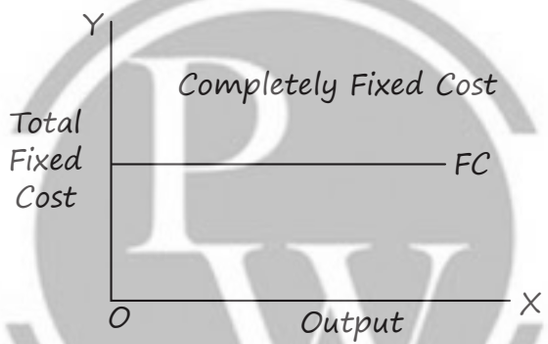


Figure: Completely Fixed Cost

- Variable costs, on the other hand are those costs which change with changes in output. These costs include payments such as wages of casual labour employed, prices of raw material, fuel and power used, transportation cost etc. If a firm shuts down for a short period, it may not use the variable factors of production and therefore, will not therefore incur any variable cost. Figure presents completely variable cost curve drawn under the assumption that variable costs change linearly with changes in output.

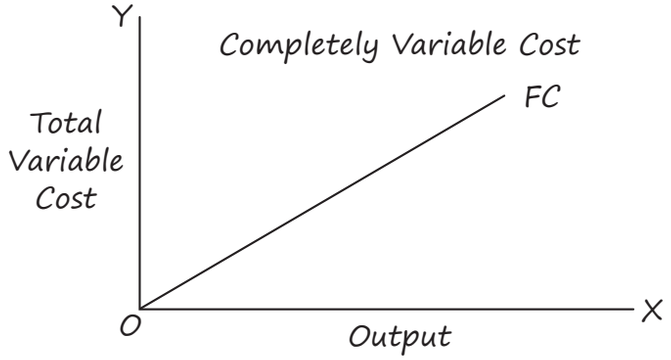


Figure: Completely Variable Cost

- There are some costs which are neither perfectly variable, nor absolutely fixed in relation to the changes in the size of output. They are known as semi-variable costs. It is well reflected in the figure. Example: Electricity charges include both a fixed charge and a charge based on consumption.

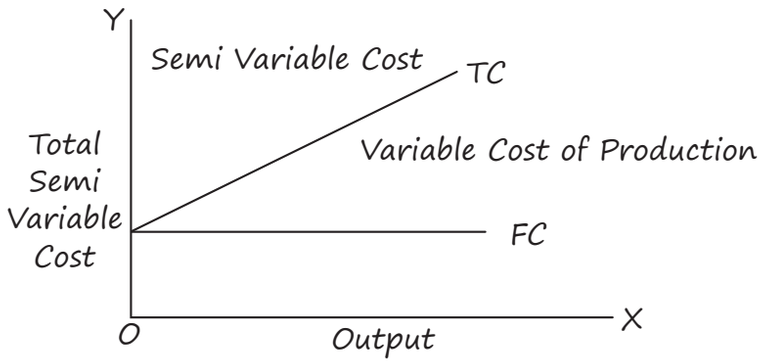


Figure: Semi Variable Cost

- There are some costs which may increase in a stair-step fashion, i.e., they remain fixed over certain range of output; but suddenly jump to a new higher level when output goes beyond a given limit. E.g. Costs incurred towards the salary of foremen will have a sudden jump if another foreman is appointed when the output crosses a particular limit.

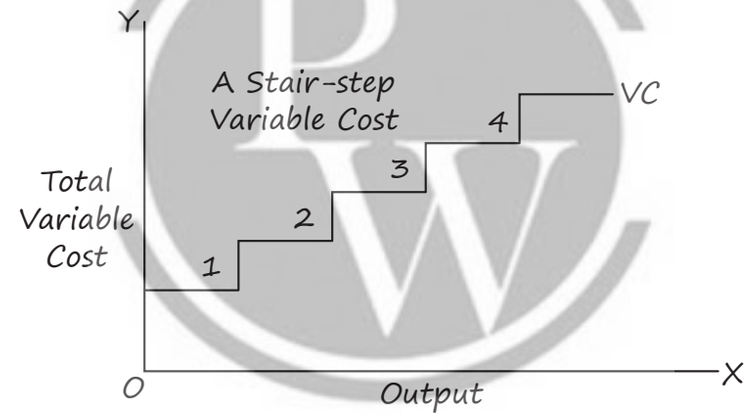


Figure: A Stair-step Variable Cost

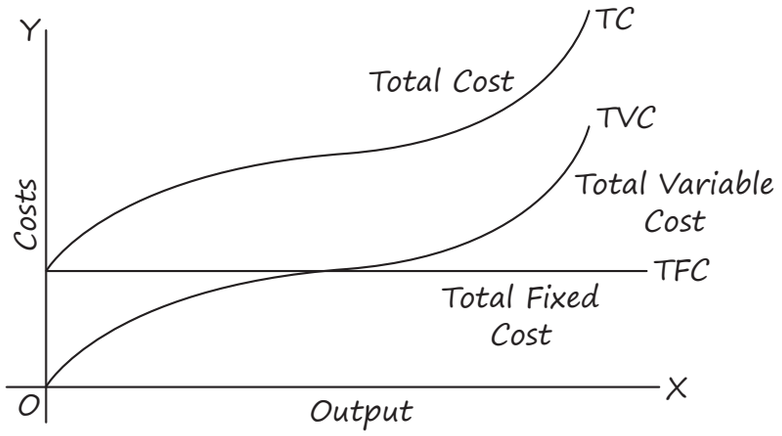


Figure: Short run Total Cost Curves

- The total cost of a business is defined as the actual cost that must be incurred for producing a given quantity of output. The short run total cost is composed of two major elements namely, total fixed cost and total variable cost. Symbolically TC = TFC + TVC. We may represent total cost, total variable cost and fixed cost diagrammatically.
- In the diagram above, the total fixed cost curve (TFC) is a horizontal straight line parallel to X-axis as TFC remains fixed for the whole range of output. This curve starts from a point on the Y-axis meaning thereby that fixed costs will be incurred even if the output is zero. On the other hand, the total variable cost curve rises upward indicating that as output increases, total variable cost increases. The total variable cost curve starts from the origin because variable costs are zero when the output is zero. It should be noted that the total variable cost initially increases at a decreasing rate and then at an increasing rate with increases in output. This pattern of change in the TVC occurs due to the operation of the law of increasing and diminishing returns to the variable inputs. Due to the operation of diminishing returns, as output increases, larger quantities of variable inputs are required to produce the same quantity of output. Consequently, variable cost curve is steeper at higher levels of output. The total cost curve has been obtained by adding vertically the total fixed cost curve and the total variable cost curve. The slopes of TC and TVC are the same at every level of output and at each point the two curves have vertical distance equal to total fixed cost. Its position reflects the amount of fixed costs and its slope reflects variable costs.

SHORT RUN AVERAGE COSTS

1. **Average Fixed Cost (AFC):** The average fixed cost is the total fixed cost divided by the number of units produced. Hence, if TFC is the total fixed cost and Q is the number of units produced, then

$$AFC = \frac{TFC}{Q}$$

Therefore, AFC is the fixed cost per unit of output.

Example: The TFC of a firm is ₹2,000. If the output is 100 units, the average fixed cost is,

$$AFC = \frac{TFC}{Q} = \frac{2000}{100} = ₹\ 20$$

If the output is increased to 200 units, then

$$AFC = \frac{TFC}{Q} = \frac{2000}{200} = ₹\ 10$$

Thus, average fixed cost is the fixed cost per unit of output. Since TFC is constant, any increase in output decreases the AFC. Note that, while the AFC can become really small, it is never zero. Therefore, if we draw an average fixed cost curve, it will slope downwards throughout its length but will not touch the X-axis as AFC cannot be zero.

2. **Average Variable Cost (AVC):** Average variable cost is found out by dividing the total variable cost by the number of units of output produced, i.e. AVC = $\frac{TVC}{Q}$ where Q is the number of units produced. Thus, average variable cost is the variable cost per unit of output. Average variable cost normally falls as output increases from zero to normal capacity output due to occurrence of increasing returns to variable factors. But beyond the normal capacity output, average variable cost will rise steeply because of the operation of diminishing returns (the concepts of increasing returns and diminishing returns have already been discussed earlier). If we draw an average variable cost curve, it will first fall, then reach a minimum and then rise.

3. **Average Total Cost (ATC):** Average total cost is the sum of average variable cost and average fixed cost. i.e., ATC = AFC + AVC. It is the total cost divided by the number of units produced, i.e. ATC = TC/Q.The behaviour of average total cost curve depends upon the behaviour of the average variable cost curve and the average fixed cost curve. In the beginning, both AVC and AFC curves fall, therefore, the ATC curve will also fall sharply. When AVC curve begins to rise, but AFC curve still falls steeply, ATC curve continues to fall. This is because, during this stage, the fall in AFC curve is greater than the rise in the AVC curve, but as output increases further, there is a sharp rise in AVC which more than offsets the fall in AFC. Therefore, ATC curve first falls, reaches its minimum and then rises. Thus, the average total cost curve is a "U" shaped curve. (Fig. 10)

4. **Marginal Cost (MC):** Marginal cost is the addition made to the total cost by the production of an additional unit of output. In other words, it is the total cost of producing t units instead of t-1 units, where t is any given number. For example, if we are producing 5 units at a cost of ₹200 and now suppose the 6th unit is produced and the total cost is ₹250, then the marginal cost is ₹250 - 200 i.e., ₹50. And marginal cost will be ₹24, if 10 units are produced at a total cost of ₹320 [(320-200) / (10-5)]. It is to be noted that marginal cost is independent of fixed cost. This is because fixed costs do not change with output. It is only the variable costs which change with a change in the level of output in the short run. Therefore, marginal cost is in fact due to the changes in variable costs. Symbolically marginal cost may be written as:

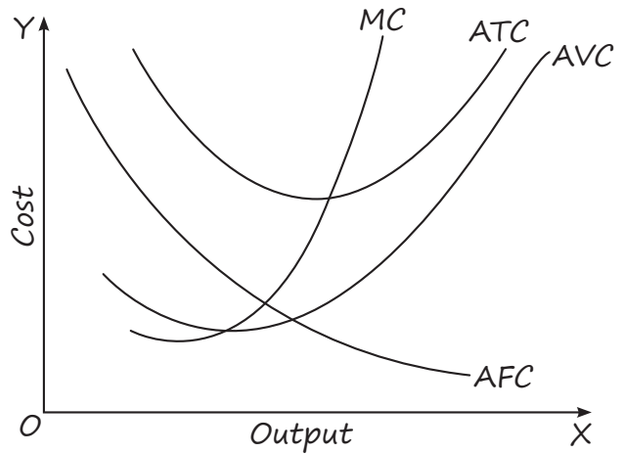
$$MC = \frac{\Delta TC}{\Delta Q}$$

DTC = Change in Total cost

DQ = Change in Output or

$MC_n = TC_n - TC_{n-1}$

Marginal cost curve falls as output increases in the beginning. It starts rising after a certain level of output. This happens because of the influence of the law of variable proportions. The MC curve becomes minimum corresponding to the point of inflexion on the total cost curve. The fact that marginal product rises first, reaches a maximum and then declines ensures that the marginal cost curve of a firm declines first, reaches its minimum and then rises. In other words marginal cost curve of a firm is "U" shaped (see Figure).



The behaviour of these costs has also been shown in Table 3.

Table: Various Costs

Units of output	Total fixed cost	Total variable cost	Total cost	Average fixed cost	Average variable cost	Average total cost	Marginal cost
0	1000	0	1000	-	-	-	-
1	1000	50	1050	1000.00	50.00	1050.00	50
2	1000	90	1090	500.00	45.00	545.00	40
3	1000	140	1140	333.33	46.67	380.00	50
4	1000	196	1196	250.00	49.00	299.00	56
5	1000	255	1255	200.00	51.00	251.00	59
6	1000	325	1325	166.67	54.17	220.83	70
7	1000	400	1400	142.86	57.14	200.00	75
8	1000	480	1480	125.00	60.00	185.00	80
9	1000	570	1570	111.11	63.33	174.44	90
10	1000	670	1670	100.00	67.00	167.00	100
11	1000	780	1780	90.91	70.91	161.82	110
12	1000	1080	2080	83.33	90.00	173.33	300

The above table shows that

1. Fixed costs do not change with increase in output upto a given level. Average fixed cost, therefore, comes down with every increase in output.
2. Variable costs increase, but not necessarily in the same proportion as the increase in output. In the above case, average variable cost comes down gradually till 4 units are produced. Thereafter it starts increasing.
3. Marginal cost is the additional cost divided by the additional units produced. This also comes down first and then starts increasing.

Relationship between Average Cost and Marginal Cost: The relationship between marginal cost and average cost is the same as that between any other marginal-average quantities. The following are the points of relationship between the two.

1. When average cost falls as a result of an increase in output, marginal cost is less than average cost.
2. When average cost rises as a result of an increase in output, marginal cost is more than average cost.
3. When average cost is minimum, marginal cost is equal to the average cost. In other words, marginal cost curve cuts average cost curve at its minimum point (i.e. optimum point).

Above Figure confirms the above points of relationship.

Formula list is given below

1. $TC = TFC + TVC$

   $\Rightarrow TFC = TC - TVC$

   $\Rightarrow TVC = TC - TFC$

2. $AC = AFC + AVC$

   $\Rightarrow AFC = AC - AVC$

   $\Rightarrow AVC = AC - AFC$

   $\boxed{\sum MC = TVC}$

3. $MC = TVC_n - TUC_{n-1} = \frac{\Delta TVC}{\Delta Q}$

   $= TCn - TC_{n-1} = \frac{\Delta TC}{\Delta Q}$

4. $AC = \frac{TC}{Q} \Rightarrow TC = AC \times Q$

   $AFC = \frac{TFC}{Q} \Rightarrow TFC = AFC \times Q$

   $AVC = \frac{TVC}{Q} \Rightarrow \boxed{TVC = AVC \times Q}$

LONG RUN AVERAGE COST CURVE

- Long run is a period of time during which the firm can vary all of its inputs;
- It can acquire a big plant if it wants to increase its output and a small plant if it wants to reduce its output. move from one plant to another;
- The long run being a planning horizon,
- It should be kept in mind that once the firm has built a particular scale of plant, its production takes place in the short run.
- Briefly put, the firm actually operates in the short run and plans for the long run.
- Long run cost of production is the least possible cost of producing any given level of output when all individual factors are variable.
- A long run cost curve depicts the functional relationship between output and the long run cost of production.
- In order to understand how the long run average cost curve is derived, we consider three short run average cost curves as shown in figure.
- These short run average cost curves (SACs) are also called 'plant curves'.
- In the long run, the firm will examine with which size of plant or on which short run average cost curve it should operate to produce a given level of output, so that the total cost is minimum.

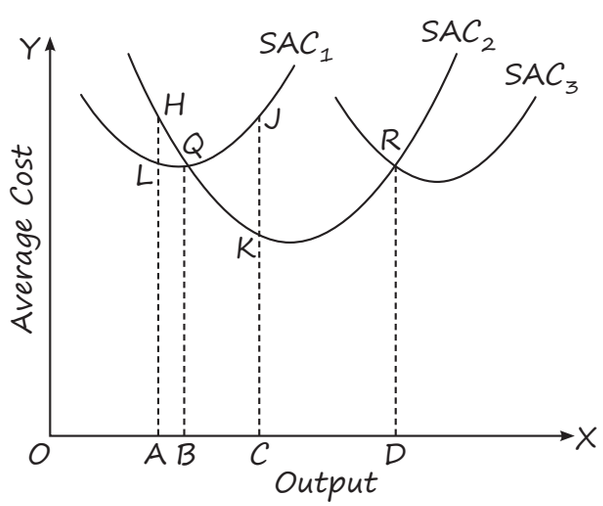


Figure: Short Run Average Cost Curves

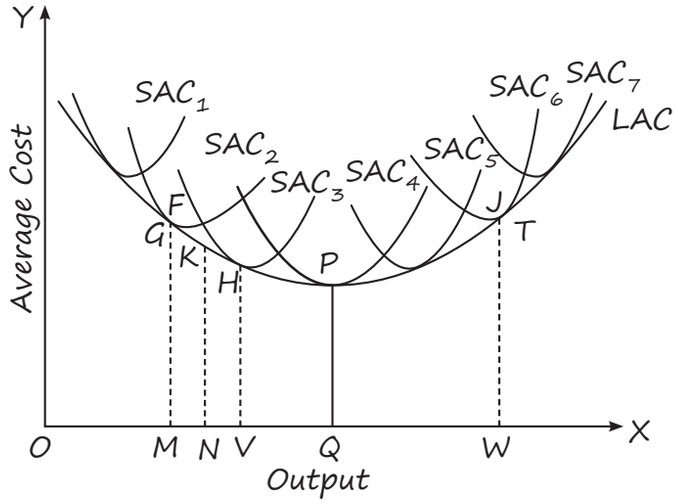


Figure: Long Run Average Cost Curves

EXPANIANTION OF LONG RUN AVERAGE COST CURVE

- The long run average cost curve is so drawn as to be tangent to each of the short run average cost curves.
- It is clear from the figure that larger output can be produced at the lowest cost with larger plant whereas smaller output can be produced at the lowest cost with smaller plants.
- For example, to produce OM, the firm will be using SAC_2 only; if it uses SAC_3, it will result in higher unit cost than SAC_2. But, larger output OV can be produced most economically with a larger plant represented by the SAC_3. If we produce OV with a smaller plant, it will result in higher cost per unit. Similarly, if we produce larger output with a smaller plant it will involve higher costs because of its limited capacity.
- It is to be noted that LAC curve is not tangent to the minimum points of the SAC curves.
- When the LAC curve is declining, it is tangent to the falling portions of the short run cost curves and when the LAC curve is rising, it is tangent to the rising portions of the short run cost curves.
- "OQ" is the optimum output. This is because "OQ" is being produced at the minimum point of LAC and corresponding SAC i.e., SAC_4.
- Other plants are either used at less than their full capacity or more than their full capacity.
- Only SAC_4 is being operated at the minimum point.
- The long run average cost curve is often called as 'planning curve'
- The long run average cost curve helps the firm in the choice of the size of the plant for producing a specific output at the least possible cost.
- Explanation of the "U" shape of the long run average cost curve:
- LAC curve is a "U" shaped curve.
- This shape of LAC curve has nothing to do with the U shaped SAC which is due to variable factor ratio because in the long run all factors are variable.

- U shaped LAC arises due to returns to scale.
- Increasing returns to scale cause fall in the long run average cost and decreasing returns to scale result in rise in long run average cost.
- Falling long run average cost and increasing economies of scale result from internal and external economies of scale and rising long run average cost and diminishing returns to scale result from internal and external diseconomies of scale.
- The long run average cost curve initially falls with increase in output and after a certain point it rises making a boat shape.
- The long-run average cost curve is also called "Envelope curve", because it envelopes or supports a family of short run average cost curves from below.

TRY YOUR UNDERSTANDING 3.2.2

1. The Cost function expresses the relationship between _____ and _____.
   (a) Costs, input (b) Costs, Output
   (c) Dependent Variable, Cost (d) None of these
2. Which of the following is a kind of Cost function?
   (a) Short-Run Cost Function (b) Long Run Cost Function
   (c) Short/Long Run Cost Curve (d) Both (a) and (b)
3. A company produces 10 units of output and incurs ₹30 per unit as variable cost and ₹5 per unit of fixed cost. What will be its total cost of producing 10 units
   (a) ₹300 (b) ₹35 (c) ₹305 (d) ₹350
4. Calculate total cost of 4 units:

Units	Total cost (*)	Marginal cost (*)
2	80	40
4	-	30

   (a) 140 (b) 120 (c) 50 (d) 40
5. If fixed cost is plotted on a graph taking output on X-axis and Cost on Y axis, the Fixed cost will be represented by _____.
   (a) Straight line parallel to Y axis (b) Straight line parallel to X axis
   (c) U Shaped Curve (d) Hyper-parabola Curve.
6. Fixed costs are _____ a function of output.
   (a) Not (b) Always (c) Treated as (d) Directly related
7. The total Cost Curve is obtained by adding _____ the _____ curve and the Curve.
   (a) Vertically, Total Fixed Cost, Total Variable Cost
   (b) Horizontally, Cost, Total
   (c) Vertically, Total Cost, Total Vari-able cost
   (d) Horizontally, Cost Valuable

8. The costs which remain fixed over certain range of output but sud-denly jump to a new higher level when production goes beyond a given limit are called:
   (a) Variable cost (b) Semi-variable cost
   (c) Stair -step variable cost (d) Jumping cost.

9. Which one of the following is correct?
   (a) AFC = AVC + ATC (b) ATC = AFC - AVC
   (c) AVC = AFC + ATC (d) AFC = ATC - AVC

10. Which of the following cost curves is never 'U' shaped?
   (a) Average total cost curve (b) Marginal cost curve
   (c) Total cost curve (d) Total Fixed cost curve

11. AFC curve is:
   (a) Convex & downward sloping (b) Concave & downward sloping
   (c) Convex & upward sloping (d) Concave & upward rising

12. Which of the following curves never tough any axis but is downward _____.
   (a) Marginal cost curve (b) Total cost curve
   (c) Average fixed cost curve (d) Average variable cost curve

13. A firm producing 7 units of output has an average total cost of ₹150 and has to pay ₹350 to its fixed factors of production whether it produces or not. How much of the average total cost is made up of variable costs?
   (a) ₹200 (b) ₹50 (c) ₹300 (d) ₹100

14. Which of the following statements is true of the relationship among the average cost functions?
   (a) ATC = AFC - AVC. (b) AVC = AFC + ATC.
   (c) AFC = ATC + AVC. (d) AFC = ATC - AVC.

15. A firm has a variable cost of ₹1000 at 5 units of output. If fixed costs are ₹400, what will be the average total cost at 5 units of output?
   (a) ₹280 (b) ₹60 (c) ₹120 (d) ₹1400

16. The change in total cost due to one unit change in the output is called _____ cost.
   (a) Marginal (b) Average (c) Average variable(d) Average fixed.

17. Marginal cost changes due to change in _____ cost.
   (a) Total (b) Fixed (c) Average (d) Variable

18. When AC curve is rising, the MC curve must be _____ to it.
   (a) Equal (b) Above (c) Below (d) Parallel

19. What happens to marginal cost when average cost increases?
   (a) Marginal cost is below average cost
   (b) Marginal cost is above average cost
   (c) Marginal cost is equal to average variable cost
   (d) Marginal cost is equal to average cost

Answer Key									
1. (b)	2. (d)	3. (d)	4. (a)	5. (b)	6. (a)	7. (a)	8. (c)	9. (d)	10. (d)
11. (a)	12. (c)	13. (d)	14. (d)	15. (a)	16. (a)	17. (d)	18. (b)	19. (d)	

ECONOMIES AND DISECONOMIES OF SCALE

THE SCALE OF PRODUCTION

Production on a large scale is a very important feature of modern industrial society. As a consequence, the size of business undertakings has greatly increased. Large-scale production offers certain advantages which help in reducing the cost of production. Economies arising out of large-scale production can be grouped into two categories; viz., internal economies and external economies. Internal economies are those economies of production which accrue to the firm when it expands its output, so that the cost of production would come down considerably and place the firm in a better position to compete in the market effectively. Internal economies arise purely due to endogenous factors relating to efficiency of the entrepreneur or his managerial talents or the type of machinery used or the marketing strategy adopted. These economies arise within the firm and are available exclusively to the expanding firm. On the other hand, external economies are the benefits accruing to each member firm of the industry as a result of expansion of the industry.

Internal Economies and Diseconomies: We saw that returns to scale increase in the initial stages and after remaining constant for a while, they decrease. The question arises as to why we get increasing returns to scale due to which cost falls and why after a certain point we get decreasing returns to scale due to which cost rises. The answer is that initially a firm enjoys internal economies of scale and beyond a certain limit it suffers from internal diseconomies of scale. Internal economies and diseconomies are of the following main kinds:

1. **Technical economies and diseconomies:** Large-scale production is associated with economies of superior techniques. As the firm increases its scale of operations, it becomes possible to use more specialized and efficient form of all factors, specially capital equipment and machinery. For producing higher levels of output, there is generally available a more efficient machinery which when employed to produce a large output yields a lower cost per unit of output. The firm is able to take advantage of composite technology whereby the whole process of production of a commodity is done as one composite unit. Secondly, when the scale of production is increased and the amount of labour and other factors become larger, introduction of greater degree of division of labour and specialization becomes possible and as a result cost per unit declines. There are some advantages available to a large firm on account of performance of a number of linked processes. The firm can reduce the inconvenience and costs associated with the dependence on other firms by undertaking various processes from the input supply stage to the final output stage.

   However, beyond a certain point, a firm experiences net diseconomies of scale. This happens because when the firm has reached a size large enough to allow utilization of almost all the possibilities of division of labour and employment of more efficient machinery, further increase in the size of the plant will bring about high long-run cost because of difficulties of management. When the scale of operations becomes too large, it becomes difficult for the management to exercise control and to bring about proper coordination.

2. **Managerial economies and diseconomies:** Managerial economies refer to reduction in managerial costs. When output increases, specialization and division of labour can be applied to management. It becomes possible to divide its management into specialized departments under specialized personnel, such as production manager, sales manager, finance manager etc. If the scale of production increases further, each department can be further sub-divided; for e.g. sales can be split into separate sections such as for advertising, exports and customer service. Since individual activities come under the supervision of specialists, management's efficiency and productivity will greatly improve. Decentralization of decision making and mechanization of managerial functions further enhance the efficiency and productivity of managers. Thus, specialization of management enables large firms to achieve reduction in managerial costs.

   However, as the scale of production increases beyond a certain limit, managerial diseconomies set in. Communication at different levels such as between the managers and labourers and among the managers become difficult resulting in delays in decision making and implementation of decisions already made. Management finds it difficult to exercise control and to bring in coordination among its various departments. The managerial structure becomes more complex and is affected by greater bureaucracy, red tapism, lengthening of communication lines and so on. All these affect the efficiency and productivity of management and that of the firm itself.

3. **Commercial economies and diseconomies:** Production of large volumes of goods requires large amount of materials and components. A large firm is able to place bulk orders for materials and components and enjoy lower prices for them. Economies can also be achieved in marketing of the product. If the sales staff is not being worked to full capacity, additional output can be sold at little or no extra cost. Moreover, large firms can benefit from economies of advertising. As the scale of production increases, advertising costs per unit of output fall. In addition, a large firm may also be able to sell its by-products or process it profitably; something which might be unprofitable for a small firm. There are also economies associated with transport and storage.

   These economies become diseconomies after an optimum scale. For example, advertisement expenditure and other marketing overheads will increase more than proportionately after the optimum scale.

4. **Financial economies and diseconomies:** A large firm has advantages over small firms in matters related to procurement of finance for its business activities. It can, for instance, offer better security to bankers and avail of advances with greater ease. On account of the goodwill enjoyed by large firms, investors have greater confidence in them and therefore would prefer their shares which can be readily sold on the stock exchange. A large firm can thus raise capital at lower cost.

   However, these costs of raising finance will rise more than proportionately after the optimum scale of production. This may happen because of relatively greater dependence on external finances.

5. **Risk bearing economies and diseconomies:** It is said that a large business with diverse and multi- production capability is in a better position to withstand economic ups and downs, and therefore, enjoys economies of risk bearing. However, risk may increase if diversification, instead of giving a cover to economic disturbances, increases these.

EXTERNAL ECONOMIES AND DISECONOMIES

Internal economies are economies enjoyed by a firm on account of use of greater degree of division of labour and specialised machinery at higher levels of output. They are internal in the sense that they accrue to the firm due to its own efforts. Besides internal economies, there are external economies which are very important for a firm. External economies and diseconomies are those economies and diseconomies which accrue to firms as a result of expansion in the output of the whole industry and they are not dependent on the output level of individual firms. They are external in the sense that they accrue to firms not out of their internal situation but from outside i.e. due to expansion of the industry. These are available to one or more of the firms in the form of:

1. **Cheaper raw materials and capital equipment:** The expansion of an industry may result in exploration of new and cheaper sources of raw material, machinery and other types of capital equipments. Expansion of an industry results in greater demand for various kinds of materials and capital equipments required by it. The firm can procure these on a large scale at competitive prices from other industries. This reduces their cost of production and consequently the prices of their output.
2. **Technological external economies:** When the whole industry expands, it may result in the discovery of new technical knowledge and in accordance with that, the use of improved and better machinery and processes than before. This will change the technical co-efficient of production and enhance productivity of firms in the industry and reduce their cost of production.
3. **Development of skilled labour:** When an industry expands in an area, the labourers in that area are well accustomed with the different productive processes and tend to learn a good deal from experience. As a result, with the growth of an industry in an area, a pool of trained labour is developed which has a favourable effect on the level of productivity and cost of the firms in that industry.
4. **Growth of ancillary industries:** Expansion of industry encourages the growth of a number of ancillary industries which specialize in the production and supply of raw materials, tools, machinery, components, repair services etc. Input prices go down in a competitive market and the benefits of it accrue to all firms in the form of reduction in cost of production. Likewise, new units may come up for processing or recycling of the waste products of the industry. This will tend to reduce the cost of production in general.
5. **Better transportation and marketing facilities:** The expansion of an industry resulting from entry of new firms may make possible the development of an efficient transportation and marketing network. These will greatly reduce the cost of production of the firms by avoiding the need for establishing and running these services by themselves. Similarly, communication systems may get modernised resulting in better and speedy information dissemination.
6. **Economies of Information:** Necessary information regarding technology, labour, prices and products may be easily and cheaply made available to the firms on account of publication of information booklets and bulletins by industry associations or by governments in public interest.

However, external economies may cease if there are certain disadvantages which may neutralise the advantages of expansion of an industry. We call them external diseconomies. External diseconomies are disadvantages that originate outside the firm, especially in the input markets. An example of external diseconomies is rise in various factor prices. When an industry expands the requirement of various factors of production, such as raw materials, capital goods, skilled labour etc increases. Increasing demand for inputs puts pressure on the input markets. This may result in an increase in the prices of factors of production, especially when they are short in supply. Moreover, too many firms in an industry at one place may also result in higher transportation cost, marketing cost and high pollution control cost. The government may also, through its location policy, prohibit or restrict the expansion of an industry at a particular place.

TRY YOUR UNDERSTANDING 3.2.3

1. If LAC curve falls as output expands, this is due to:
   (a) Law of diminishing returns (b) Economics of scale
   (c) Law of variable proportion (d) Dis-economics of scale
2. Planning curve is related to which of the following?
   (a) Short run average cost curve (b) Long run average cost curve
   (c) Average variable cost (d) Average total cost
3. The negatively-sloped (i.e. falling) part of the long-run average total cost curve is due to which of the following?
   (a) Diseconomies of scale.
   (b) Diminishing returns.
   (c) The difficulties encountered in coordinating the many activities of a large firm.
   (d) The increase in productivity that results from specialization.
4. External economies accrue due to _____:
   (a) Increasing returns to scale (b) Increasing returns to factor
   (c) Law of variable proportion (d) Low cost
5. External Economies arise due to:
   (a) Growth of ancillary industries
   (b) High cost of technologies
   (c) Increase in the price of factors of production
   (d) None of the above
6. External Economies of Scale are obtained by:
   (a) A firm (b) A group of firm
   (c) Small Production (d) Society
7. External economics are enjoyed:
   (a) By large producers only (b) As firm expands
   (c) Both (a) and (b) (d) None of the above

Answer Key

1. (b) **2.** (b) **3.** (d) **4.** (a) **5.** (a) **6.** (b) **7.** (c)

Name of economist used in this chapter	
Cyrt & March	5 Goals – Profit goals, production goal, inventory goal, sales market share goal
Paul H. Douglas & C. W. Cobb	Applies not to only individual firm but to the whole of manufacturing industry
Chamberlin	Distinction between selling cost and production cost
Frank Knight	Profit is the reward for bearing uncertainties

EXERCISE

1. Which of the following is considered production in Economics?

(a) Tilling of soil.

(b) Singing a song before friends.

(c) Preventing a child from falling into a manhole on the road.

(d) Painting a picture for pleasure.

2. Identify the correct statement:

(a) The average product is at its maximum when marginal product is equal to average product.

(b) The law of increasing returns to scale relates to the effect of changes in factor proportions.

(c) Economies of scale arise only because of indivisibilities of factor proportions.

(d) Internal economies of scale can accrue when industry expands beyond optimum.

3. Which of the following is not a characteristic of land?

(a) Its supply for the economy is limited.

(b) It is immobile.

(c) Its usefulness depends on human efforts.

(d) It is produced by our forefathers.

4. Which of the following statements is true?

(a) Accumulation of capital depends solely on income of individuals.

(b) Savings can be influenced by government policies.

(c) External economies go with size and internal economies with location.

(d) The supply curve of labour is an upward slopping curve.

5. In the production of wheat, all of the following are variable factors that are used by the farmer except:
   (a) The seed and fertilizer used when the crop is planted.
   (b) The field that has been cleared of trees and in which the crop is planted.
   (c) The tractor used by the farmer in planting and cultivating not only wheat but also corn and barley.
   (d) The number of hours that the farmer spends in cultivating the wheat fields.

6. The marginal product of a variable input is best described as:
   (a) Total product divided by the number of units of variable input.
   (b) The additional output resulting from a one unit increase in the variable input.
   (c) The additional output resulting from a one unit increase in both the variable and fixed inputs.
   (d) The ratio of the amount of the variable input that is being used to the amount of the fixed input that is being used.

7. Diminishing marginal returns implies:
   (a) Decreasing average variable costs. (b) Decreasing marginal costs.
   (c) Increasing marginal costs. (d) Decreasing average fixed costs.

8. The short run, as economists use the phrase, is characterized by:
   (a) At least one fixed factor of production and firms neither leaving nor entering the industry.
   (b) Generally a period which is shorter than one year.
   (c) All factors of production are fixed and no variable inputs.
   (d) All inputs are variable and production is done in less than one year. (1 Mark)

9. The marginal, average, and total product curves encountered by the firm producing in the short run exhibit all of the following relationships except:
   (a) When total product is rising, average and marginal product may be either rising or falling.
   (b) When marginal product is negative, total product and average product are falling
   (c) When average product is at a maximum, marginal product equals average product, and total product is rising.
   (d) When marginal product is at a maximum, average product equals marginal product, and total product is rising.

10. To economists, the main difference between the short run and the long run is that:
   (a) In the short run all inputs are fixed, while in the long run all inputs are variable
   (b) In the short run the firm varies all of its inputs to find the least-cost combination of inputs.
   (c) In the short run, at least one of the firm's input levels is fixed.
   (d) In the long run, the firm is making a constrained decision about how to use existing plant and equipment efficiently.

11. Which of the following is the best definition of "production function"?

(a) The relationship between market price and quantity supplied.

(b) The relationship between the firm's total revenue and the cost of production.

(c) The relationship between the quantities of inputs needed to produce a given level of output.

(d) The relationship between the quantity of inputs and the firm's marginal cost of production.

12. The "law of diminishing returns" applies to:

(a) the short run, but not the long run.

(b) the long run, but not the short run.

(c) both the short run and the long run.

(d) neither the short run nor the long run.

13. Diminishing returns occur:

(a) When units of a variable input are added to a fixed input and total product falls.

(b) When units of a variable input are added to a fixed input and marginal product falls.

(c) When the size of the plant is increased in the long run.

(d) When the quantity of the fixed input is increased and returns to the variable input falls.

Direction: Use the following information to answer questions 14-16.

Hours of Labour	Total Output	Marginal Product
0	–	–
1	100	100
2	–	80
3	240	–

14. What is the total output when 2 hours of labour are employed?

(a) 80 (b) 100 (c) 180 (d) 200

15. What is the marginal product of the third hour of labour?

(a) 60 (b) 80 (c) 100 (d) 240

16. What is the average product of the first three hours of labour?

(a) 60 (b) 80 (c) 100 (d) 240

17. Which cost increases continuously with the increase in production?

(a) Average cost. (b) Marginal cost.

(c) Fixed cost. (d) Variable cost.

18. Which of the following cost curves is never 'U' shaped?

(a) Average cost curve. (b) Marginal cost curve.

(c) Average variable cost curve. (d) Average fixed cost curve.

19. Total cost in the short run is classified into fixed costs and variable costs. Which one of the following is a variable cost?
    (a) Cost of raw materials.
    (b) Cost of equipment.
    (c) Interest payment on past borrowings.
    (d) Payment of rent on building.

20. In the short run, when the output of a firm increases, its average fixed cost:
    (a) increases.
    (b) decreases.
    (c) remains constant.
    (d) first declines and then rises.

21. Which one of the following is also known as planning curve?
    (a) Long run average cost curve.
    (b) Short run average cost curve.
    (c) Average variable cost curve.
    (d) Average total cost curve.

22. If a firm moves from one point on a production isoquant to another, which of the following will not happen.
    (a) A change in the ratio in which the inputs are combined to produce output.
    (b) A change in the ratio of marginal products of the inputs.
    (c) A change in the marginal rate of technical substitution.
    (d) A change in the level of output.

23. With which of the following is the concept of marginal cost closely related?
    (a) Variable cost.
    (b) Fixed cost.
    (c) Opportunity cost.
    (d) Economic cost.

24. Which of the following statements is correct?
    (a) When the average cost is rising, the marginal cost must also be rising.
    (b) When the average cost is rising, the marginal cost must be falling.
    (c) When the average cost is rising, the marginal cost is above the average cost.
    (d) When the average cost is falling, the marginal cost must be rising.

25. Which of the following is an example of "explicit cost"?
    (a) The wages a proprietor could have made by working as an employee of a large firm.
    (b) The income that could have been earned in alternative uses by the resources owned by the firm.
    (c) The payment of wages by the firm.
    (d) The normal profit earned by a firm.

26. Which of the following is an example of an "implicit cost"?
    (a) Interest that could have been earned on retained earnings used by the firm to finance expansion.
    (b) The payment of rent by the firm for the building in which it is housed.
    (c) The interest payment made by the firm for funds borrowed from a bank.
    (d) The payment of wages by the firm.

Direction: Use the following data to answer questions 27-29.

Output (O)	0	1	2	3	4	5	6
Total Cost (TC)	₹240	₹330	₹410	₹480	₹540	₹610	₹690

27. The average fixed cost of 2 units of output is :

(a) ₹80 (b) ₹85 (c) ₹120 (d) ₹205

28. The marginal cost of the sixth unit of output is :

(a) ₹133 (b) ₹75 (c) ₹80 (d) ₹450

29. Diminishing marginal returns start to occur between units:

(a) 2 and 3. (b) 3 and 4. (c) 4 and 5. (d) 5 and 6.

30. Marginal cost is defined as:

(a) the change in total cost due to a one unit change in output.

(b) total cost divided by output.

(c) the change in output due to a one unit change in an input.

(d) total product divided by the quantity of input.

31. Which of the following is true of the relationship between the marginal cost function and the average cost function?

(a) If MC is greater than ATC, then ATC is falling.

(b) The ATC curve intersects the MC curve at minimum MC.

(c) The MC curve intersects the ATC curve at minimum ATC.

(d) If MC is less than ATC, then ATC is increasing.

32. Which of the following statements is true of the relationship among the average cost functions?

(a) ATC = AFC − AVC. (b) AVC = AFC + ATC.

(c) AFC = ATC + AVC. (d) AFC = ATC − AVC.

33. Which of the following is not a determinant of the firm's cost function?

(a) The production function. (b) The price of labour.

(c) Taxes. (d) The price of the firm's output.

34. Which of the following statements is correct concerning the relationships among the firm's cost functions?

(a) TC = TFC − TVC. (b) TVC = TFC − TC.

(c) TFC = TC − TVC. (d) TC = TVC − TFC.

35. Suppose output increases in the short run. Total cost will:

(a) Increase due to an increase in fixed costs only.

(b) Increase due to an increase in variable costs only.

(c) Increase due to an increase in both fixed and variable costs.

(d) Decrease if the firm is in the region of diminishing returns.

36. Which of the following statements concerning the long-run average cost curve is false?
    (a) It represents the least-cost input combination for producing each level of output.
    (b) It is derived from a series of short-run average cost curves.
    (c) The short-run cost curve at the minimum point of the long-run average cost curve represents the least–cost plant size for all levels of output.
    (d) As output increases, the amount of capital employed by the firm increases along the curve.

37. The negatively-sloped (i.e. falling) part of the long-run average total cost curve is due to which of the following?
    (a) Diseconomies of scale.
    (b) Diminishing returns.
    (c) The difficulties encountered in coordinating the many activities of a large firm.
    (d) The increase in productivity that results from specialization.

38. The positively sloped (i.e. rising) part of the long run average total cost curve is due to which of the following?
    (a) Diseconomies of scale.
    (b) Increasing returns.
    (c) The firm being able to take advantage of large-scale production techniques as it expands its output.
    (d) The increase in productivity that results from specialization.

39. A firm's average total cost is ₹300 at 5 units of output and ₹320 at 6 units of output. The marginal cost of producing the 6th unit is :
    (a) ₹20 (b) ₹120 (c) ₹320 (d) ₹420

40. A firm producing 7 units of output has an average total cost of ₹150 and has to pay ₹350 to its fixed factors of production whether it produces or not. How much of the average total cost is made up of variable costs?
    (a) ₹200 (b) ₹50 (c) ₹300 (d) ₹100

41. A firm has a variable cost of ₹1000 at 5 units of output. If fixed costs are ₹400, what will be the average total cost at 5 units of output?
    (a) ₹280 (b) ₹60 (c) ₹120 (d) ₹1400

42. A firm's average fixed cost is ₹20 at 6 units of output. What will it be at 4 units of output?
    (a) ₹60 (b) ₹30 (c) ₹40 (d) ₹20

43. Which of the following statements is true?
    (a) The services of a doctor are considered production.
    (b) Man can create matter.
    (c) The services of a housewife are considered production.
    (d) When a man creates a table, he creates matter.

44. Which of the following is a function of an entrepreneur?
    (a) Initiating a business enterprise. (b) Risk bearing.
    (c) Innovating. (d) All of the above.

45. In describing a given production technology, the short run is best described as lasting:
    (a) up to six months from now. (b) up to five years from now.
    (c) as long as all inputs are fixed. (d) as long as at least one input is fixed.

46. If decreasing returns to scale are present, then if all inputs are increased by 10% then:
    (a) output will also decrease by 10%.
    (b) output will increase by 10%.
    (c) output will increase by less than 10%.
    (d) output will increase by more than 10%.

47. The production function is a relationship between a given combination of inputs and:
    (a) another combination that yields the same output.
    (b) the highest resulting output.
    (c) the increase in output generated by one-unit increase in one output.
    (d) all levels of output that can be generated by those inputs.

48. If the marginal product of labour is below the average product of labour, it must be true that:
    (a) the marginal product of labour is negative.
    (b) the marginal product of labour is zero.
    (c) the average product of labour is falling.
    (d) the average product of labour is negative.

49. The average product of labour is maximized when marginal product of labour:
    (a) equals the average product of labour.
    (b) equals zero.
    (c) is maximized.
    (d) none of the above.

50. The law of variable proportions is drawn under all of the assumptions mentioned below except the assumption that:
    (a) the technology is changing.
    (b) there must be some inputs whose quantity is kept fixed.
    (c) we consider only physical inputs and not economically profitability in monetary terms.
    (d) the technology is given and stable.

51. What is a production function?
    (a) Technical relationship between physical inputs and physical output.
    (b) Relationship between fixed factors of production and variable factors of production.
    (c) Relationship between a factor of production and the utility created by it.
    (d) Relationship between quantity of output produced and time taken to produce the output.

52. Laws of production does not include _____.

(a) returns to scale.
(b) law of diminishing returns to a factor.
(c) law of variable proportions.
(d) least cost combination of factors.

53. An iso quant shows

(a) All the alternative combinations of two inputs that can be produced by using a given set of output fully and in the best possible way.
(b) All the alternative combinations of two products among which a producer is indifferent because they yield the same profit.
(c) All the alternative combinations of two inputs that yield the same total product.
(d) Both (b) and (c).

54. Economies of scale exist because as a firm increases its size in the long run:

(a) Labour and management can specialize in their activities more.
(b) As a larger input buyer, the firm can get finance at lower cost and purchase inputs at a lower per unit cost.
(c) The firm can afford to employ more sophisticated technology in production.
(d) All of these.

55. The production function:

(a) Is the relationship between the quantity of inputs used and the resulting quantity of product.
(b) Tells us the maximum attainable output from a given combination of inputs.
(c) Expresses the technological relationship between inputs and output of a product.
(d) All the above.

56. The production process described below exhibits.

Number of Workers	Output
0	0
1	23
2	40
3	50

(a) constant marginal product of labour.
(b) diminishing marginal product of labour.
(c) increasing return to scale.
(d) increasing marginal product of labour.

57. Which of the following is a variable cost in the short run?

(a) rent of the factory.
(b) wages paid to the factory labour.
(c) interest payments on borrowed financial capital.
(d) payment on the lease for factory equipment.

58. The efficient scale of production is the quantity of output that minimizes
    (a) average fixed cost. (b) average total cost.
    (c) average variable cost (d) marginal cost.

59. In the short run, the firm's product curves show that
    (a) Total product begins to decrease when average product begins to decrease but continues to increase at a decreasing rate.
    (b) When marginal product is equal to average product, average product is decreasing but at its highest.
    (c) When the marginal product curve cuts the average product curve from below, the average product is equal to marginal product.
    (d) In stage two, total product increases at a diminishing rate and reaches maximum at the end of this stage.

60. A fixed input is defined as
    (a) That input whose quantity can be quickly changed in the short run, in response to the desire of the company to change its production.
    (b) That input whose quantity cannot be quickly changed in the short run, in response to the desire of the company to change its production.
    (c) That input whose quantities can be easily changed in response to the desire to increase or reduce the level of production.
    (d) That input whose demand can be easily changed in response to the desire to increase or reduce the level of production.

61. Average product is defined as
    (a) total product divided by the total cost.
    (b) total product divided by marginal product.
    (c) total product divided by the number of units of variable input.
    (d) marginal product divided by the number of units of variable input.

62. Which of the following statements is true?
    (a) After the inflection point of the production function, a greater use of the variable input induces a reduction in the marginal product.
    (b) Before reaching the inevitable point of decreasing marginal returns, the quantity of output obtained can increase at an increasing rate.
    (c) The first stage corresponds to the range in which the AP is increasing as a result of utilizing increasing quantities of variable inputs.
    (d) All the above.

63. Marginal product, mathematically, is the slope of the
    (a) total product curve. (b) average product curve.
    (c) marginal product curve. (d) implicit product curve.

64. Suppose the first four units of a variable input generate corresponding total outputs of 200, 350, 450, 500. The marginal product of the third unit of input is:
    (a) 50 (b) 100 (c) 150 (d) 200

65. Which of the following statements is false in respect of fixed cost of a firm?

(a) As the fixed inputs for a firm cannot be changed in the short run, the TFC are constant, except when the prices of the fixed inputs change.

(b) TFC continue to exist even when production is stopped in the short run, but they exist in the long run even when production is not stopped.

(c) Total Fixed Costs (TFC) can be defined as the total sum of the costs of all the fixed inputs associated with production in the short run.

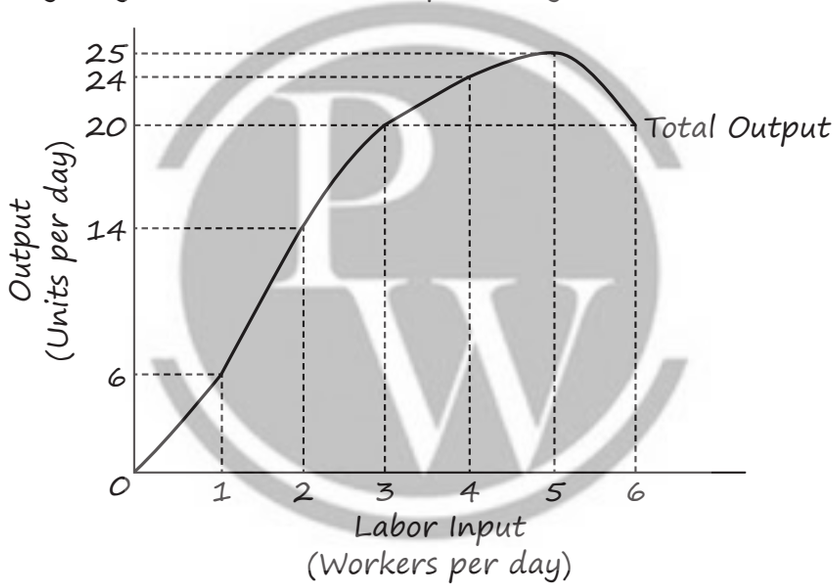
(d) In the short run, a firm's fixed cost cannot be escaped even when production is stopped.

66. Diminishing marginal returns for the first four units of a variable input is exhibited by the total product sequence:

(a) 50, 50, 50, 50 (b) 50, 110, 180, 260

(c) 50, 100, 150, 200 (d) 50, 90, 120, 140

67. Use the following diagram to answer the question given below it



The marginal physical product of the third unit of labour is _____, the MP of the _____ labour is Negative

(a) Six; fourth (b) Six; third (c) Six ; fifth (d) Six; sixth

68. In the third of the three stages of production:

(a) the marginal product curve has a positive slope.

(b) the marginal product curve lies completely below the average product curve.

(c) total product increases.

(d) marginal product is positive.

69. When marginal costs are below average total costs,

(a) average fixed costs are rising. (b) average total costs are falling.

(c) average total costs are rising. (d) average total costs are minimized.

70. A firm's long-run average total cost curve is
   (a) Identical to its long-run marginal-cost curve.
   (b) Also its long-run supply curve because it explains the relationship between price and quantity supplied.
   (c) In fact the average total cost curve of the optimal plant in the short run as it tries to produce at least cost.
   (d) Tangent to all the curves of short-run average total cost.

71. In the long run, if a very small factory were to expand its scale of operations, it is likely that it would initially experience
   (a) an increase in pollution level.
   (b) diseconomies of scale.
   (c) economies of scale.
   (d) constant returns to scale.

72. A firm's long-run average total cost curve is.
   (a) Identical to its long-run marginal-cost curve as all factors are variable.
   (b) Also its long-run total cost curve because it explains the relationship cost and quantity supplied in the long run.
   (c) In fact the average total cost curve of the optimal plant in the short run as it tries to produce at least cost.
   (d) Tangent to all short-run average total cost the curves and represents the lowest average total cost for producing each level of output.

73. Which of the following statements describes increasing returns to scale?
   (a) Doubling of all inputs used leads to doubling of the output.
   (b) Increasing the inputs by 50% leads to a 25% increase in output.
   (c) Increasing inputs by 1/4 leads to an increase in output of 1/3.
   (d) None of the above.

74. The marginal cost for a firm of producing the 9th unit of output is ` 20. Average cost at the same level of output is ` 15. Which of the following must be true?
   (a) marginal cost and average cost are both falling
   (b) marginal cost and average cost are both rising
   (c) marginal cost is rising and average cost is falling
   (d) it is impossible to tell if either of the curves are rising or falling

75. Implicit cost can be defined as
   (a) Money payments made to the non-owners of the firm for the self-owned factors employed in the business and therefore not entered into books of accounts.
   (b) Money not paid out to the owners of the firm for the self-owned factors employed in a business and therefore not entered into books of accounts.
   (c) Money payments which the self-owned and employed resources could have earned in their next best alternative employment and therefore entered into books of accounts.
   (d) Money payments which the self-owned and employed resources earn in their best use and therefore entered into book of accounts.

76. The most important function of an entrepreneur is to _____.

(a) Innovate (b) Bear the sense of responsibility

(c) Finance (d) Earn profit

77. Economic costs of production differ from accounting costs of production because

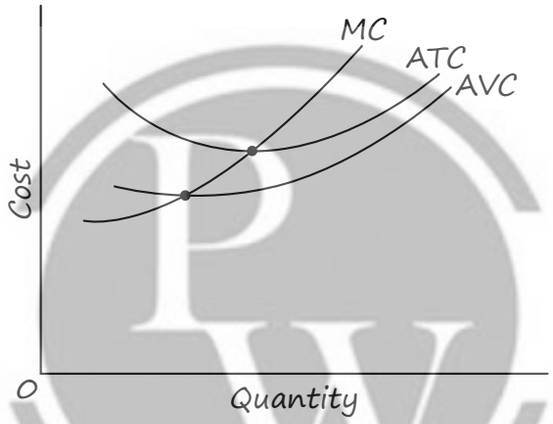
(a) Economic costs include expenditures for hired resources while accounting costs do not.

(b) Accounting costs include opportunity costs which are deducted later to find paid out costs.

(c) Accounting costs include expenditures for hired resources while economic costs do not.

(d) Economic costs add the opportunity cost of a firm which uses its own resources.

78. In figure below, possible reason why the average variable cost curve approaches the average total cost curve as output rises is:



(a) Fixed costs are falling while total costs are rising at rising output.

(b) Total costs are rising and average costs are also rising.

(c) Marginal costs are above average variable costs as output rises.

(d) Average fixed costs are falling as output rises.

79. Marginal cost changes due to changes in _____.

(a) Total cost (b) Average cost (c) Variable cost (d) Quantity of output

80. Which of the following statements is correct?

(a) Fixed costs vary with change in output.

(b) If we add total variable cost and total fixed cost we get the average cost.

(c) Marginal cost is the result of total cost divided by number of units produced.

(d) Total cost is obtained by adding up the fixed cost and total variable cost.

81. Which of the following statements is incorrect?

(a) The LAC curve is also called the planning curve of a firm.

(b) Total revenue = price per unit × number of units sold.

(c) Opportunity cost is also called alternative cost.

(d) If total revenue is divided by the number of units sold we get marginal revenue.

82. The vertical difference between TVC and TC is equal to–

(a) MC (b) AVC (c) TFC (d) None of the above

Answer Key

1. (a)	2. (a)	3. (d)	4. (b)	5. (b)	6. (b)	7. (c)	8. A	9. (d)	10. (c)
11. (c)	12. (a)	13. (b)	14. (c)	15. (a)	16. (b)	17. (d)	18. (d)	19. (a)	20. (b)
21. (a)	22. (d)	23. (a)	24. (c)	25. (c)	26. (a)	27. (c)	28. (c)	29. (c)	30. (a)
31. (c)	32. (d)	33. (d)	34. (c)	35. (b)	36. (c)	37. (d)	38. (a)	39. (d)	40. (d)
41. (a)	42. (b)	43. (a)	44. (d)	45. (d)	46. (c)	47. (b)	48. (c)	49. (a)	50. (a)
51. (a)	52. (d)	53. (c)	54. (d)	55. (d)	56. (b)	57. (b)	58. (b)	59. (d)	60. (b)
61. (c)	62. (d)	63. (a)	64. (b)	65. (b)	66. (d)	67. (d)	68. (b)	69. (b)	70. (d)
71. (c)	72. (d)	73. (c)	74. (b)	75. (b)	76. (a)	77. (d)	78. (d)	79. (c)	80. (d)
81. (d)	82. (c)								

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