CHAPTER 3

THEORY OF PRODUCTION AND COST

UNIT -1: THEORY OF PRODUCTION

LEARNING OUTCOMES

After studying this unit, you would be able to:

- Define Production and Describe Production Function.
- Describe the Characteristics of various Factors of Production.
- Distinguish between Short run and Long run Production Functions.
- Illustrate the Law of Diminishing Returns and Returns to Scale.
- Describe Production Optimisation using Isoquants and Iso-cost curves.

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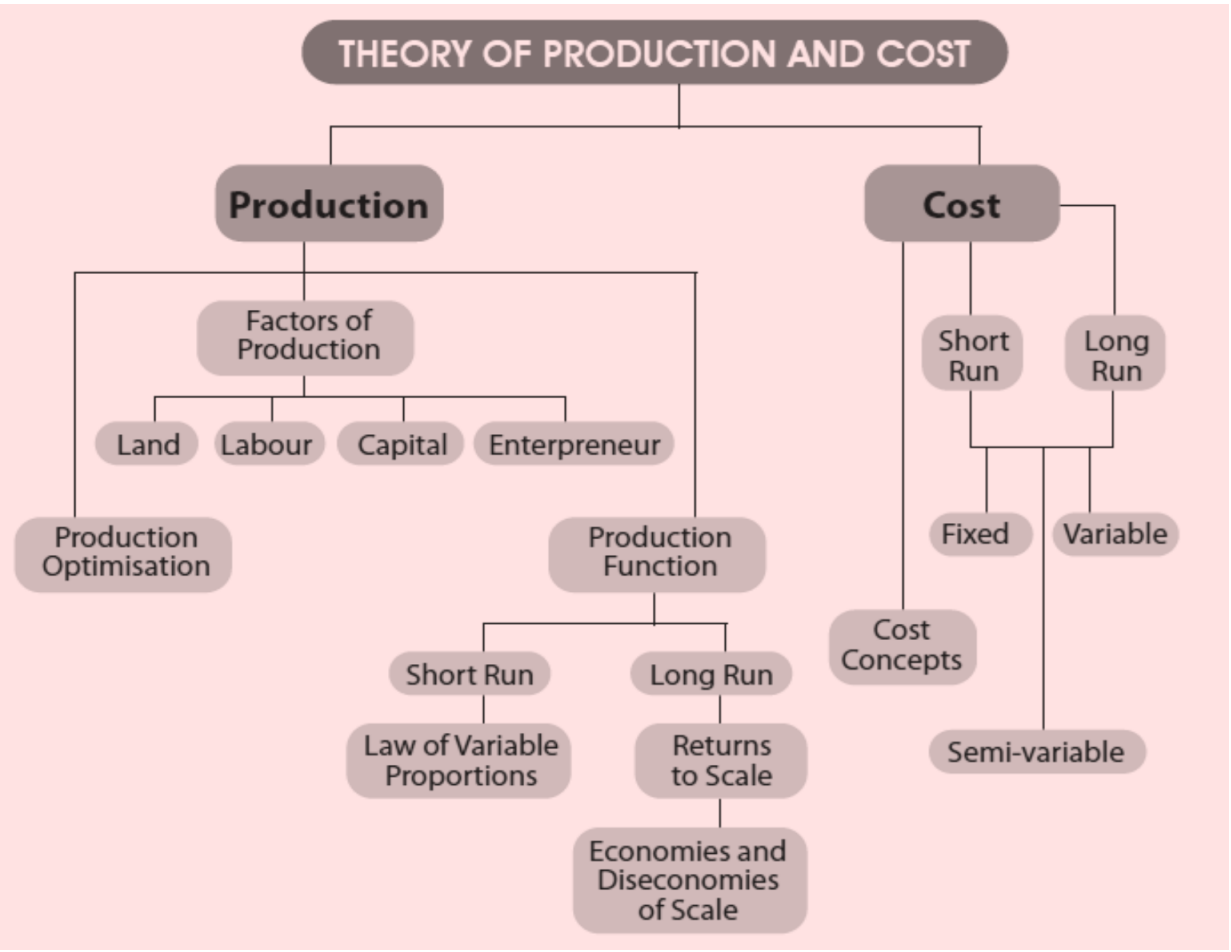
CHAPTER OVERVIEW



1.0 MEANING OF PRODUCTION

Production is a very important economic activity. As we are aware, the survival of any firm in a competitive market depends upon its ability to produce goods and services at a competitive cost. One of the principal concerns of business managers is the achievement of optimum efficiency in production by minimising the cost of production. The performance of an economy is judged by the level of its production. The amount of goods and services an economy is able to produce determines the richness or poverty of that economy. In fact, the standard of living of people depends on the volume and variety of goods and services produced in a country. Thus, the U.S.A. is a rich country just because its level of production is high.

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In common parlance, the term 'production' is used to indicate an activity of making something material. The growing of wheat, rice or any other agricultural crop by farmers and manufacturing of cement, radio-sets, wool, machinery or any other industrial product is often referred to as production. What exactly do we mean by production in Economics? In Economics the word 'production' is used in a wider sense to denote the process by which man utilises resources such as men, material, capital, time etc, working upon them to transform them into commodities and services so as to make them satisfy human wants. In other words, production is any economic activity which converts inputs into outputs which are capable of satisfying human wants. Whether it is making of material goods or providing a service, it is included in production provided it satisfies the wants of some people. Therefore, in Economics, activities such as making of cloth by an industrial worker, the services of the retailer who delivers it to consumers, the work of doctors, lawyers, teachers, actors, dancers, etc. are production.

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".

It should be noted that production should not be taken to mean as creation of matter because, according to the fundamental law of science, man cannot create matter. What a man can do is only to create or add utility to things that already exist in nature. Production can also be defined as creation or addition of utility. 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:

(i) Changing the form of natural resources. Most manufacturing processes consist of use of physical inputs such as raw materials and transforming them into physical products possessing utility, e.g., changing the form of a log of wood into a table or changing the form of iron into a machine. This may be called conferring utility of form.

(ii) Changing the place of the resources from a place where they are of little or no use to another place where they are of greater use. This utility of place can be obtained by:

  (a) Extraction from earth e.g., removal of coal, minerals, gold and other metal ores from mines and supplying them to markets.

  (b) Transferring goods from where they give little or no satisfaction, to places where their utility is more, e.g., tin in Malaya is of little use until it is brought

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to the industrialised centres where necessary machinery and technology are available to produce metal boxes for packing. Another example is: apples in Kashmir orchards have a little utility to farmers. But when the apples are transported to markets where human settlements are thick and crowded like the city centres, they afford more satisfaction to greater number of people. These examples emphasise the additional utility conferred on goods, by all forms of transportation systems, by transport workers and by the agents who assist in the movement and marketing of goods.

(iii) Making available materials at times when they are not normally available e.g., harvested food grains are stored for use till next harvest. Canning of seasonal fruits is undertaken to make them available during off-season. This may be called conferring of utility of time.

(iv) Making use of personal skills in the form of services, e.g., those of organisers, merchants, transport workers etc.

The fundamental purpose of all these activities is the same, namely to create utility in some manner. Thus, production is nothing but creation of utilities in the form of goods and services. For example, in the production of a woollen suit, utility is created in some form or the other. Firstly wool is changed into woollen cloth at the spinning and weaving mill (utility created by changing the form). Then, it is taken to a place where it is to be sold (utility added by transporting it). Since woollen clothes are used only in winter, they will be retained until such time when they are required by purchasers (time utility). In the whole process, the services of various groups of people are utilised (as that of mill workers, shopkeepers, agents etc.) to contribute to the enhancement of utility. Thus, the entire process of production is nothing but creation of form utility, place utility, time utility and/or personal utility.

It should be noted that the production process need not necessarily involve conversion of physical inputs into physical output. For example, production of services such as those of lawyers, doctors, musicians, consultants etc. involves intangible inputs to produce intangible output. But, 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.

The money expenses incurred in the process of production, i.e., for transforming resources into finished products constitute the cost of production. Although cost of production is not taken into account for a pure production analysis, it is an extremely vital matter for any business decision-making. Nevertheless, in the theory of production, we would confine ourselves to laws of production, production function and methods of production optimisation. However, it is necessary to remember that a production decision cannot

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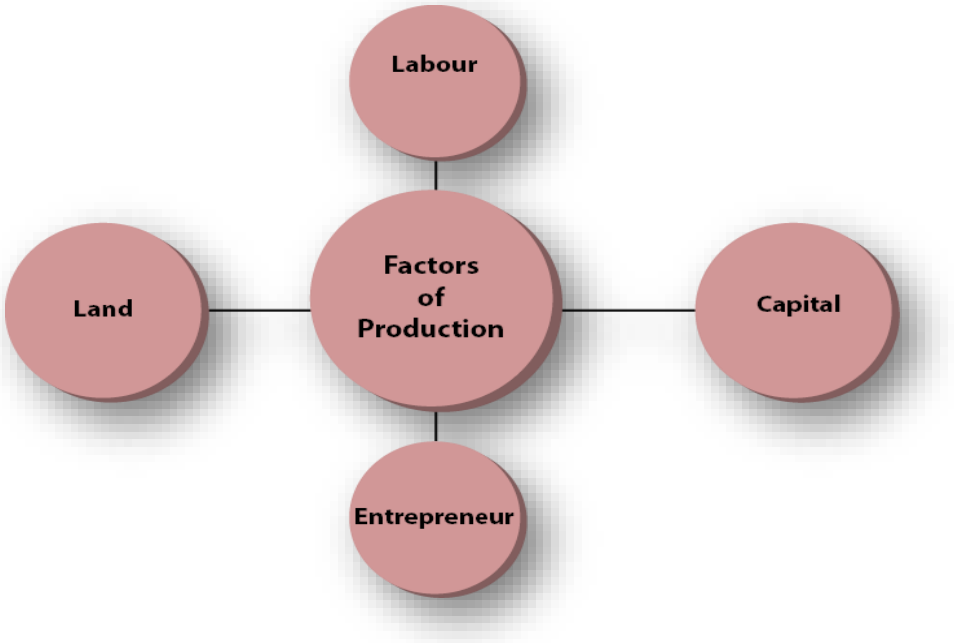
depend merely on physical productivity based on operating efficiency alone. The profitability of a productive activity would depend upon the revenue realised from the output and the costs incurred in raising that output. Aspects of cost and revenue will be discussed in the following units.

1.1 FACTORS OF PRODUCTION

Factors of production refer to inputs. An input is a good or service which a firm buys for use in its production process. Production process requires a wide variety of inputs, depending on the nature of output. The process of producing goods in a modern economy is very complex. A good has to pass through many stages and many hands until it reaches the consumers' hands in a finished form. Land, labour, capital and entrepreneurial ability are the four factors or resources which make it possible to produce goods and services. Even a small piece of bread cannot be produced without the active participation of these factors of production. While land is a free gift of nature and refers to natural resources, the human endeavour is classified functionally and qualitatively into three main components namely, labour, capital and entrepreneurial skills.



We may discuss these factors of production briefly in the following paragraphs.

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1.1.0 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. It becomes difficult at times to state precisely as to what part of a given factor is due solely to gift of nature and what part belongs to human effort made on it in the past. Therefore, as a theoretical concept, we may list the following characteristics which would qualify a given factor to be called land:

(i) **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

(ii) **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.

(iii) **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.

(iv) **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.

(v) **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.

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

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

1.1.1 Labour

The term 'labour', means any mental or physical exertion directed to produce goods or services. All human efforts of body or of mind undergone partly or wholly with a view to secure an income apart from the pleasure derived directly from the work is termed as labour. In other words, it refers to various types of human efforts which require the use of physical exertion, skill and intellect. It is, however, difficult to say that in any human effort all

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the three are not required; the proportion of each might vary. Labour, to have an economic significance, must be one which is done with the motive of some economic reward. Anything done out of love and affection, although very useful in increasing human well-being, is not labour in the economic sense of the term. It implies that any work done for the sake of pleasure or love does not represent labour in Economics. It is for this reason that the services of a house-wife are not treated as labour, while those of a maid servant are treated as labour. If a person sings just for the sake of pleasure, it is not considered as labour despite the exertion involved in it. On the other hand, if a person sings against payment of some fee, then this activity signifies labour.

Characteristics of labour:

- **Human Effort:** Labour, as compared with other factors is different. It is connected with human efforts whereas others are not directly connected with human efforts. As a result, there are certain human and psychological considerations which may come up unlike in the case of other factors. Therefore, leisure, fair treatment, favourable work environment etc. are essential for labourers.
- **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.
- **Labour is an active factor:** Without the active participation of labour, land and capital may not produce anything.
- **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.
- **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.
- **All labour may not be productive:** (i.e.) all efforts are not sure to produce resources.
- **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. The labourer is economically weak while the employer is

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economically powerful although things have changed a lot in favour of labour during 20th and 21st centuries.

- **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.
- **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.
- **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. This feature gives rise to a peculiar backward bending shape to the supply curve of labour. 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.

1.1.2 Capital

We may define capital as that part of wealth of an individual or community which is used for further production of wealth. In fact, capital is a stock concept which yields a periodical income which is a flow concept. It is necessary to understand the difference between capital and wealth. Whereas wealth refers to all those goods and human qualities which are useful in production and which can be passed on for value, only a part of these goods and services can be characterised as capital because if these resources are lying idle they will constitute wealth but not capital.

Capital has been rightly defined as 'produced means of production' or 'man-made instruments of production'. In other words, capital refers to all man made goods that are used for further production of wealth. This definition distinguishes capital from both land and labour because both land and labour are not produced factors. They are primary or original factors of production, but capital is not a primary or original factor; it is a produced factor of production. It has been produced by man by working with nature. Machine tools and instruments, factories, dams, canals, transport equipment etc., are some of the examples of capital. All of them are produced by man to help in the production of further goods.

Types of Capital:

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.

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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.

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

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.

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.

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

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

Capital Formation: Capital formation means a sustained increase in the stock of real capital in a country. In other words, capital formation involves production of more capital goods like, machines, tools, factories, transport equipments, electricity etc. which are used for further production of goods. Capital formation is also known as investment.

The need for capital formation or investment is realised not merely for replacement and renovation but for creating additional productive capacity. In order to accumulate capital goods, some current consumption has to be sacrificed and savings of current income are to be made. Savings are also to be channelised into productive investment. The greater the extent that people are willing to abstain from present consumption, the greater the extent of savings and investment that society will devote to new capital formation. If a society consumes all what it produces and saves nothing, the future productive capacity of the economy will fall when the present capital equipment wears out. In other words, if the whole of the current present capacity is used to produce consumer goods and no new capital goods are made, production of consumer goods in the future will greatly decline. It is prudent to cut down some of the present consumption and direct part of it to the making of capital goods such as, tools and instruments, machines and transport facilities, plant and equipment etc. Higher rate of capital formation will enhance production and productive capacity, increase the efficacy of production efforts, accelerate economic growth and add to opportunities for employment.

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

1. **Savings:** The basic factor on which formation of capital depends is the ability to save. The ability to save depends upon the income of an individual. Higher incomes are generally followed by higher savings. This is because, with an increase in income, the propensity to consume comes down and the propensity to save increases. This is true

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not only for an individual but also for the economy as a whole. A rich country has greater ability to save and thereby can get richer quickly compared to a poor country which has no ability to save and therefore has limited capacity for growth in national income, given the capital output ratio.

It is not only the ability to save, but the willingness to save also counts a great deal. Willingness to save depends upon the individual's concern about his future as well as upon the social set-up in which he lives. If an individual is far sighted and wants to make his future secure, he will save more. Moreover, the government can enforce compulsory savings on employed people by making insurance and provident fund compulsory. Government can also encourage saving by allowing tax deductions on income saved. In recent years, business community's savings and government's savings are also becoming important.

2. **Mobilisation of savings:** It is not enough that people save money; the saved money should enter into circulation and facilitate the process of capital formation. Availability of appropriate financial products and institutions is a necessary precondition for mobilisation of savings. There should be a wide spread network of banking and other financial institutions to collect public savings and to take them to prospective investors. In this process, the state has a very important and positive role to play both in generating savings through various fiscal and monetary incentives and in channelising the savings towards priority needs of the community so that there is not only capital generation but also socially beneficial type of capital formation.

3. **Investment:** The process of capital formation gets completed only when the real savings get converted into real capital assets. An economy should have an entrepreneurial class which is prepared to bear the risk of business and invest savings in productive avenues so as to create new capital assets.

1.1.3 Entrepreneur

Having explained the three factors namely land, labour and capital, we now turn to the description of the fourth factor of production, namely, the entrepreneur. It is not enough to say that production is a function of land, capital and labour. There must be some factor which mobilises these factors, combines them in the right proportion, initiates the process of production and bears the risks involved in it. This factor is known as the entrepreneur. He has also been called the organiser, the manager or the risk taker. But, in these days of specialisation and separation of ownership and management, the tasks performed by a manager or organiser have become different from that of the entrepreneur. While organisation and management involve decision-making of routine and non-routine types,

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the task of the entrepreneur is to initiate production work and to bear the risks involved in it.

Functions of an entrepreneur: In general, an entrepreneur performs the following functions:

(i) ***Initiating business enterprise and resource co-ordination*:** An entrepreneur senses business opportunities, conceives project ideas, decides on scale of operation, products and processes and builds up, owns and manages his own enterprise. The first and the foremost function of an entrepreneur is to initiate a business enterprise. An entrepreneur perceives opportunity, organizes resources needed for exploiting that opportunity and exploits it. He undertakes the dynamic process of obtaining different factors of production such as land, labour and capital, bringing about co-ordination among them and using these economic resources to secure higher productivity and greater yield. An entrepreneur hires the services of various other factors of production and pays them fixed contractual rewards: labour is hired at predetermined rate of wages, land or factory building at a fixed rent for its use and capital at a fixed rate of interest. The surplus, if any, after paying for all factors of production hired by him, accrues to the entrepreneur as his reward for his efforts and risk-taking. Thus, the reward for an entrepreneur, that is a profit, is not certain or fixed. He may earn profits, or incur losses. Other factors get the payments agreed upon, irrespective of whether the entrepreneur makes profits or losses.

(ii) ***Risk bearing or uncertainty bearing*:** The ultimate responsibility for the success and survival of business lies with the entrepreneur. What is planned and anticipated by the entrepreneur may not come true and the actual course of events may differ from what was anticipated and planned. The economy is dynamic and changes occur every day. The demand for a commodity, the cost structure, fashions and tastes of the people and government's policy regarding taxation, credit, interest rate etc. may change. All these changes bring about changes in the cost and/or demand conditions of a business firm. It may happen that as a result of certain broad changes which were not anticipated by the entrepreneur, the firm has to incur losses. Thus, the entrepreneur has to bear these financial risks. Apart from financial risks, the entrepreneur also faces technological risks which arise due to the inventions and improvement in techniques of production, making the existing techniques and machines obsolete. The entrepreneur has to assess and bear the risks. However, Frank Knight is of the opinion that profit is the reward for bearing uncertainties. An entrepreneur need not bear the foreseeable risks such as of fire, theft, burglary etc. as these can be insured against. Uncertainties are different from risks in the sense that these cannot be insured against and therefore, the entrepreneur has to bear them. For example genuine business uncertainties such as change in tastes,

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emergence of competition etc. cannot be foreseen or insured against. Thus, an entrepreneur earns profits because he bears uncertainty in a dynamic economy where changes occur every day. While nearly all functions of an entrepreneur can be delegated or entrusted with paid managers, risk bearing cannot be delegated to anyone. Therefore, risk bearing is the most important function of an entrepreneur

(iii) ***Innovations*****:** According to Schumpeter, the true function of an entrepreneur is to introduce innovations. Innovation refers to commercial application of a new idea or invention to better fulfilment of business requirements. Innovations, in a very broad sense, include the introduction of new or improved products, devices and production processes, utilisation of new or improved source of raw-materials, adoption of new or improved technology, novel business models, extending sales to unexplored markets etc. According to Schumpeter, the task of the entrepreneur is to continuously introduce new innovations. These innovations may bring in greater efficiency and competitiveness in business and bring in profits to the innovator. A successful innovation will be imitated by others in due course of time. Therefore, an innovation may yield profits for the entrepreneur for a short time but when it is widely adopted by others, the profits tend to disappear. The entrepreneurs promote economic growth of the country by introducing new innovations from time to time and contributing to technological progress. But innovations involve risks and only a few individuals in the society are capable of introducing new innovations. The greater the innovating ability, the greater the supply of entrepreneurs in the economy, and greater will be the rate of technological progress.

Enterprise's objectives and constraints

The standard assumption about an enterprise is that its business activity is carried out with the sole objective of earning profits. However, in the real world, enterprises do not make decisions based exclusively on profit maximisation objective alone. Since an enterprise functions in the economic, social, political and cultural environment, its objectives will have to be set up in relation to its survival and growth in such environments.

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

(1) Organic objectives

(2) Economic objectives

(3) Social objectives

(4) Human objectives

(5) National objectives

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1. ***Organic objectives*:** The basic minimum objective of all kinds of enterprises is to survive or to stay alive. An enterprise can survive only if it is able to produce and distribute products or services at a price which enables it to recover its costs. If an enterprise does not recover its costs of staying in business, it will not be in a position to meet its obligations to its creditors, suppliers and employees with the result that it will be forced into bankruptcy. Therefore, survival of an enterprise is essential for the continuance of its business activity. Once the enterprise is assured of its survival, it will aim at growth and expansion.

   Growth as an objective has assumed importance with the rise of professional managers. R.L. Marris's theory of firm assumes that the goal that managers of a corporate firm set for themselves is to maximise the firm's balanced growth rate subject to managerial and financial constraints. In corporate firms, the structural division of ownership and management, yields opportunity for mangers to set goals which may not conform to the utility function of owner shareholders. It is pointed out that ability or success of the managers is judged by their performance in promoting the growth or expansion of the firm and rewards obtained by them are reflection of their success is achieving growth of the firms managed by them. While owners want to maximise their utility function which relate to profit, capital, market share and public reputation, the managers want to maximise their utility function which includes variables such as salary, power, and status and job security. Although there is divergence and some degree of conflict between these utility functions, Marris argues that most of the variables incorporated in both of them are positively related to size of the firm and therefore, the two utility functions converge into a single variable, namely, a steady growth in the size of the firm. The managers do not aim at optimising profits; rather they aim at optimisation of the balanced rate of growth of the firm which involves optimisation of the rate of increase of demand for the commodities of the firm and the rate of increase of capital supply.

2. ***Economic objectives*:** The profit maximising behaviour of the firm has been the most basic assumption made by economists over the last more than two hundred years and is still at the heart of neo classical micro economic theory. This assumption is simple, rational and quantitative and is amenable to equilibrium analysis. Under this assumption, the firm determines the price and output policy in such a way as to maximize profits within the constraints imposed upon it such as technology, finance etc. The investors expect that their company will earn sufficient profits in order to ensure fair dividends to them and to improve the prices of their stocks. Not only investors but creditors and employees are also interested in a profitable enterprise. Creditors will be reluctant to lend money to an enterprise which is not making

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profits. Similarly, any increase in salaries, wages and perquisite of employees can come only out of profits.

The definition of profits in Economics is different from the accountants' definition of profits. Profit, in the accounting sense, is the difference between total revenue and total costs of the firm. Economic profit is the difference between total revenue and total costs, but total costs here costs include both explicit and implicit costs. Accounting profit considers only explicit costs while economic profit reflects explicit and implicit costs i.e. the cost of self-owned factors used by the entrepreneur in his own business. Since economic profit includes these opportunity costs associated with self-owned factors, it is generally lower than the accounting profit. When the economist speaks of profits, s/he means profits after taking into account the capital and labour provided by the owners i.e. s/he differentiates between normal profits and super normal profits. Normal profits include normal rate of return on capital invested by the entrepreneur, remuneration for the labour and the reward for risk bearing function of the entrepreneur.

Normal profit (zero economic profit) is a component of costs and therefore what a business owner considers as the minimum necessary to continue in the business. Supernormal profit, also called economic profit or abnormal profit is over and above normal profits. It is earned when total revenue is greater than the total costs. Total costs in this case include a reward to all the factors, including normal profit.

The profit maximisation objective has been subject to severe criticism in recent years. Many economists have pointed out that all firms do not aim to maximise profits. Some firms try to achieve security, subject to reasonable level of profits. H A Simon argues that firms have 'satisfying' behaviour and strive for profits that are satisfactory. Baumol's theory of sales maximisation holds that sales revenue maximisation rather than profit maximisation is the ultimate goal of the business firms. He cites empirical evidence for his hypothesis that sales rank ahead of profits as the main objective of the enterprise. He asserts that it is quite a common experience that when an executive is asked about his business, he will answer that his sales have been increasing (or decreasing) and talks about profits only as an afterthought. He, however, points out that in their attempt to maximise sales, businessmen do not completely ignore costs incurred on output and profits to be made.

In 1932, A. A. Berle and G.C. Means pointed out that in large business corporations, management is separated from ownership and therefore the managers enjoy discretionary powers to set goals of the firm they manage. Williamson's model of maximisation of managerial utility function is an important contribution to

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managerial theory of firms' behaviour. The owners (shareholders) of joint stock companies prefer profit maximisation; but managers maximise their own utility function subject to a minimum profit, rather than maximising profit.

The objective of utility maximization has been discussed in the context of two types of firms: First in case of firms owned and managed by the entrepreneur himself, utility maximisation implies that in choosing an output level, the entrepreneur owner considers not only the money profits which he will make, but also the sacrifice of leisure which he would have to make in doing the necessary activity for producing that level of output. Second, in case of large joint stock companies, the utility function of managers or executives of these companies includes not only the profits which they earn for the shareholders but also the promotion of sales, maintaining lavish offices, seeking to have a larger member of staff under their supervision etc. In this case, the manager will maximise his utility by attaining a best combination of profits and the above mentioned other objectives. Cyert and March suggests four possible functional goals in addition to profit goal namely, production goal, inventory goal, sales goal and market share goal.

3. ***Social objectives*:** Since an enterprise lives in a society, it cannot grow unless it meets the needs of the society. Some of the important social objectives of business are:

   - To maintain a continuous and sufficient supply of unadulterated goods and articles of standard quality.
   - To avoid profiteering and anti-social practices.
   - To create opportunities for gainful employment for the people in the society.
   - To ensure that the enterprise's output does not cause any type of pollution - air, water or noise.

   An enterprise should consistently endeavour to contribute to the quality of life of its community in particular and the society in general. If it fails to do so, it may not survive for long.

4. ***Human objectives*:** Human beings are the most precious resources of an organisation. If they are ignored, it will be difficult for an enterprise to achieve any of its other objectives. Therefore, the comprehensive development of its human resource or employees' should be one of the major objectives of an organisation. Some of the important human objectives are:

   - To provide fair deal to the employees at different levels

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- To develop new skills and abilities and provide a work climate in which they will grow as mature and productive individuals.
- To provide the employees an opportunity to participate in decision-making in matters affecting them.
- To make the job contents interesting and challenging.

If the enterprise is conscious of its duties towards its employees, it will be able to 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.

Since all the enterprises have multiple goals, they need to set priorities. This requires appropriate balancing of the objectives in order to determine the relative importance of each.

Various objectives of an enterprise may conflict with one another. For example, the profit maximisation objective may not be wholly consistent with the marketing objective of increasing its market share which may involve improvement in quality, slashing down of product prices, improved customer service, etc. Similarly, its social responsibility objective may run into conflict with the introduction of technological changes which may cause unemployment or environmental pollution. In such situations, the manager has to strike a balance between the two so that both can be achieved with reasonable success.

In the above paragraphs, we have discussed the different objectives of an enterprise. However, no comprehensive economic theory explaining the multitudes of behaviour of firms under various market conditions (perfect competition, monopoly, etc.) has been developed so far. Therefore, in rest of this book, we shall continue to assume that firms aim at maximising profits until and unless otherwise mentioned.

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In the pursuit of this objective, an enterprise's actions may get constrained by many factors. Important among them are:

- Lack of knowledge and information: The enterprise functions in an uncertain world where due to lack of accurate information, many variables that affect the performance of the firm cannot be correctly predicted for the current month or the current year, let alone for the future years. Similarly, the firms may not know about the prices of all inputs and the characteristics of all relevant technologies. Under such circumstances, it is very difficult to determine what the profit maximising price is.
- There may be other constraints such as restrictions imposed in the public interest by the state on the production, price and movement of factors. In practice, there are several hindrances for free mobility of labour and capital. For example, trade unions may place several restrictions on the mobility of labour or specialised training may be required to enable workers to change occupation. These contingencies may make attainment of maximum profits a difficult task.
- 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.
- Changes in business and economic conditions which become contagious due to the highly connected nature of economies, place constraints by causing demand fluctuations and instability in firms' sales and revenues. Besides, external factors such as sudden change in government policies with regard to location, prices, taxes, production, etc. or natural calamities like fire, flood etc. may place additional burdens on the business firms and defeat their plans. When firms are forced to implement policies in response to fiscal limitations, legal, regulatory, or contractual requirements, these have adverse consequences on the firms' profitability and growth plans.
- 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. 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

An enterprise faces a number of problems from its inception, through its life time and till its closure. We shall try to get a few insights about them from the following discussion.

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***Problems relating to objectives*:** As mentioned earlier, an enterprise functions in the economic, social, political and cultural environment. Therefore, it has to set its objectives in relation to its environment. The problem is that these objectives are multifarious and very often conflict with one another. For example, the objective of maximising profits is in conflict with the objective of increasing the market share which generally involves improving the quality, slashing the prices etc. Thus the enterprise faces the problem of not only choosing its objectives but also striking a balance among them.

***Problems relating to location and size of the plant*:** An enterprise has to decide about the location of its plant. It has to decide whether the plant should be located near the source of raw material or near the market. It has to consider costs such as cost of labour, facilities and cost of transportation. Of course, the entrepreneur will have to weigh the relevant factors against one another in order to choose the right location which is most economical.

Another problem relates to the size of the firm. It has to decide whether it is to be a small scale unit or large scale unit. Due consideration will have to be given to technical, managerial, marketing and financial aspects of the proposed business before deciding on the scale of operations. It goes without saying that the management must make a realistic evaluation of its strengths and limitations while choosing a particular size for a new unit.

***Problems relating to selecting and organising physical facilities*:** A firm has to make decision on the nature of production process to be employed and the type of equipments to be installed. The choice of the process and equipments will depend upon the design chosen and the required volume of production. As a rule, production on a large scale involves the use of elaborate, specialized and complicated machinery and processes. Quite often, the entrepreneur has to choose from among different types of equipments and processes of production. Such a choice will be based on the evaluation of their relative cost and efficiency. Having determined the equipment to be used and the processes to be employed, the entrepreneur will prepare a layout illustrating the arrangement of equipments and buildings and the allocation for each activity.

***Problems relating to Finance*:** An enterprise has to undertake not only physical planning but also expert financial planning. Financial planning involves (i) determination of the amount of funds required for the enterprise with reference to the physical plans already prepared (ii) assessment of demand and cost of its products (iii) 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 (iv) determining capital structure and the appropriate time for financing the enterprise etc.

Problems relating to organisation structure: An enterprise also faces problems relating to the organisational structure. It has to divide the total work of the enterprise into major specialised functions and then constitute proper departments for each of its specialized

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functions. Not only this, the functions of all the positions and levels would have to be clearly laid down and their inter-relationship (in terms of span of control, authority, responsibility, etc) should be properly defined. In the absence of clearly defined roles and relationships, the enterprise may not be able to function efficiently.

***Problems relating to marketing*:** Proper marketing of its products and services is essential for the survival and growth of an enterprise. For this, the enterprise has to discover its target market by identifying its actual and potential customers, and determine tactical marketing tools it can use to produce desired responses from its target market. After identifying the market, the enterprise has to make decision regarding 4 P's namely,

- **Product:** variety, quality, design, features, brand name, packaging, associated services, utility etc.
- **Promotion:** Methods of communicating with consumers through personal selling, social contacts, advertising, publicity etc.
- **Price:** Policies regarding pricing, discounts, allowance, credit terms, concessions, etc.
- **Place:** Policy regarding coverage, outlets for sales, channels of distribution, location and layout of stores, inventory, logistics etc.

***Problems relating to legal formalities*:** A number of legal formalities have to be carried out during the time of launching of the enterprise as well as during its life time and its closure. These formalities relate to assessing and paying different types of taxes (corporate tax, excise duty, sales tax, custom duty, etc.), maintenance of records, submission of various types of information to the relevant authorities from to time, adhering to various rules and laws formulated by government (for example, laws relating to location, environmental protection and control of pollution, size, wages and bonus, corporate management licensing, prices) etc.

Problems relating to industrial relations: With the emergence of the present day factory system of production, the management has to devise special measures to win the co-operation of a large number of workers employed in industry. Misunderstanding and conflict of interests have assumed enormous dimensions that these cannot be easily and promptly dealt with. Industrial relations at present are much more involved and complicated. Various problems which an enterprise faces with regard to industrial relations are - the problem of winning workers' cooperation, the problem of enforcing proper discipline among workers, the problem of dealing with organised labour and the problem of establishing a state of democracy in the industry by associating workers with the management of industry.

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1.2 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. More specifically, 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:

$$Q = f(a, b, c, d \ldots\ldots n)$$

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.

Assumptions of Production Function: There are three main assumptions underlying any production function.

First we assume that the relationship between inputs and outputs exists for a specific period of time. In other words, Q is not a measure of accumulated output over time.

Second, it is assumed that there is a given "state-of-the-art" in the production technology. Any innovation would cause change in the relationship between the given inputs and their output. For example, use of robotics in manufacturing or a more efficient software package for financial analysis would change the input-output relationship.

Third assumption is that whatever input combinations are included in a particular function, the output resulting from their utilization is at the maximum level.

The production function can be defined as:

The relationship between the maximum amount of output that can be produced and the input required to make that output. It is defined for a given state of technology i.e., the maximum amount of output that can be produced with given quantities of inputs under a given state of technical knowledge. (Samuelson)

It can also be defined as the minimum quantities of various inputs that are required to yield a given quantity of output.

The output takes the form of volume of goods or services and the inputs are the different factors of production i.e., land, labour, capital and enterprise. To illustrate, for a company which produces beverages, the inputs could be fixed assets such as plant and machinery; raw materials such as carbonated water, sweeteners and flavourings and labour such as assembly line workers, support-staff and supervisory personnel.

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:

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Q = f (L, K). Where Q = Output

L= Labour

K= Capital

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. It is to be noted that 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). In fact, it refers to the extent to which a firm can vary the amounts of the inputs in the production process. A period will be considered short-run period if the amount of at least one of the inputs used remains unchanged during that period. Thus, 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). Generally, it has been observed that during the short period or in the short run, a firm cannot install a new capital equipment to increase production. It implies that capital is a fixed factor in the short run. Thus, 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.

The production function can also be studied in the long run. 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.

1.2.0 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.

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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. Although, the Cobb-Douglas production function suffers from many shortcomings, it is extensively used in Economics as an approximation.

1.2.1 The Law of Variable Proportions or The Law of Diminishing Returns

In the short run, the input output relations are studied with one variable input (labour) with all other inputs held constant. The laws of production under these conditions are known under various names as the law of variable proportions (as the behaviour of output is studied by changing the proportion in which inputs are combined) the law of returns to a variable input (as any change in output is taken as resulting from the additional variable input) or the law of diminishing returns (as returns eventually diminish).

The law states that as we increase the quantity of one input which is combined with other fixed inputs, the marginal physical productivity of the variable input must eventually decline. In other words, an increase in some inputs relative to other fixed inputs will, in a given state of technology, cause output to increase; but after a point, the extra output resulting from the same addition of extra input will become less and less.

Before discussing this law, if would be appropriate to understand the meaning of total product, average product and marginal product.

Total Product (TP): Total product is the total output resulting from the efforts of all the factors of production combined together at any time. If the inputs of all but one factor are held constant, the total product will vary with the quantity used of the variable factor. Column (1) of Table 1 presents the quantity of variable factor (labour) used along with the factors whose quantity is held constant and column (2) represent the total product at various levels of use of the variable input.

Table 1: Product Schedule

Quantity of labour	Total Product (TP)	Average Product (AP)	Marginal Product (MP)
(1)	(2)	(3)	(4)
1	100	100.0	100
2	210	105.0	110
3	330	110.0	120
4	440	110.0	110
5	520	104.0	80

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6	600	100.0	80
7	670	95.7	70
8	720	90.0	50
9	750	83.3	30
10	750	75.0	0
11	740	67.3	–10

We find that when one unit of labour is employed along with other factors of production, the total product is 100 units. When two units of labour are employed, the total product rises to 210 units. The total product goes on rising as more and more units of labour are employed. With 9 or 10 units of labour, the total product rises to maximum level of 750 units. When 11 units of labour are employed, total product falls to 740 units due to negative returns from the 11^{th} unit of labour.

Average Product (AP): Average product is the total product per unit of the variable factor.

$$AP = \frac{\text{Total Product}}{\text{No. of units of Variable Factors}}$$

It is shown as a schedule in column (3) of Table 1. When one unit of labour is employed, average product is 100, when two units of labour are employed, average product rises to 105. This goes on, as shown in Table 1.

Marginal Product (MP): Marginal product is the change in total product per unit change in the quantity of variable factor. In other words, it is the addition made to the total production by an additional unit of input. Symbolically,

$$MP_n = TP_n - TP_{n-1}$$

The computed value of the marginal product appears in the last column of Table 1. For example, the MP corresponding to 4 units is given as 110 units. This reflects the fact that an increase in labour from 3 to 4 units, has increased output from 330 to 440 units.

Relationship between Average Product and Marginal Product: Both average product and marginal product are derived from the total product. Average product is obtained by dividing total product by the number of units of the variable factor and marginal product is the change in total product resulting from a unit increase in the quantity of variable factor. The relationship between average product and marginal product can be summed up as follows:

(i) when average product rises as a result of an increase in the quantity of variable input, marginal product is more than the average product.

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(ii) 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.

(iii) when average product falls, marginal product is less than the average product.

Table 1 and Figure 1 confirm the above relationship.

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. In other words, 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 (for example, we cannot build a plant or dismantle a plant in the short run).

The law operates under certain assumptions which are as follows:

1. 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.

2. 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.

3. The law does not apply to those cases where the factors must be used in fixed proportions to yield output. When the various factors are required to be used in fixed proportions, an increase in one factor would not lead to any increase in output i.e., marginal product of the variable factor will then be zero and not diminishing.

4. 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. In order to understand these three stages or laws, we may graphically illustrate the production function with one variable factor. This is done in Figure 1.

In this figure, the quantity of variable factor is depicted on the X axis and the Total Product (TP), Average Product (AP) and Marginal Product (MP) are shown on the Y-axis. As the figure shows, the TP curve goes on increasing upto to a point and after that it starts declining. AP and MP curves first rise and then decline; MP curve starts declining earlier than the AP curve.

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The behaviour of these Total, Average and Marginal Products of the variable factor consequent on the increase in its amount is generally divided into three stages (laws) which are explained below.

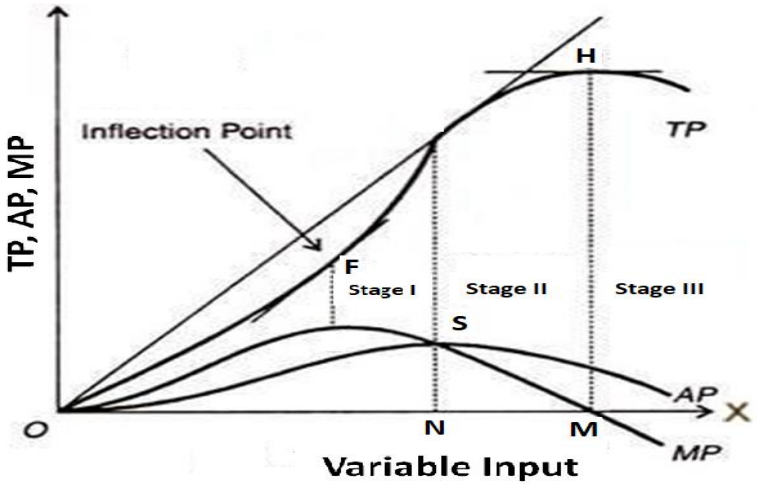

Fig. 1: Law of Variable Proportions

Stage 1: The Stage of Increasing Returns: In this stage, the total product increases at an increasing rate upto a point (in figure upto point F), marginal product also rises and is maximum at the point corresponding to the point of inflexion and average product goes on rising. From point F onwards during the stage one, 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.

Thus, in the first stage, the AP curve rises throughout whereas the marginal product curve first rises and then starts falling after reaching its maximum. It is to be noted that the marginal product although starts declining, remains greater than the average product throughout the stage so that average product continues to rise.

Explanation of law of increasing returns: The law of increasing returns operates because in the beginning, the quantity of fixed factors is abundant relative to the quantity of the variable factor. As more units of the variable factor are added to the constant quantity of the fixed factors, the fixed factors are more intensively and effectively utilised i.e., the efficiency of the fixed factors increases as additional units of the variable factors are added to them. This causes the production to increase at a rapid rate. For example, if a machine can be efficiently operated when four persons are working on it and if in the beginning we are operating it only with three persons, production is bound to increase if the fourth person is also put to work on the machine since the machine will be effectively utilised to its optimum. This happens because, in the beginning some amount of fixed factor remained unutilised and, therefore, when the variable factor is increased, fuller utilisation of the fixed factor becomes possible and it results in increasing returns. A question arises as to why the fixed

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factor is not initially taken in a quantity which suits the available quantity of the variable factor. The answer is that, generally, those factors which are indivisible are taken as fixed. Indivisibility of a factor means that due to technological requirements, a minimum amount of that factor must be employed whatever be the level of output. Thus, as more units of the variable factor are employed to work with an indivisible fixed factor, output greatly increases due to fuller utilisation of the latter. The second reason why we get increasing returns at the initial stage is that as more units of the variable factor are employed, the efficiency of the variable factor increases. This is because introduction of division of labour and specialisation becomes possible with sufficient quantity of the variable factor and these results in higher productivity.

Stage 2: **Stage of Diminishing Returns:** In stage 2, the total product continues to increase at a diminishing rate until it reaches its maximum at point H, where the second stage ends. In this stage, both marginal product and average product of the variable factor are diminishing but are positive. At the end of this stage i.e., at point M (corresponding to the highest point H of the total product curve), the marginal product of the variable factor is zero. 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 law of diminishing returns: The question arises as to why we get diminishing returns after a certain amount of the variable factor has been added to the fixed quantity of that factor. As explained above, increasing returns occur primarily because of more efficient use of fixed factors as more units of the variable factor are combined to work with it. Once the point is reached at which the amount of variable factor is sufficient to ensure efficient utilisation of the fixed factor, any further increases in the variable factor will cause marginal and average product to decline because the fixed factor then becomes inadequate relative to the quantity of the variable factor. Continuing the above example, when four men were put to work on one machine, the optimum combination was achieved. Now, if the fifth person is put on the machine, his contribution will be nil. In other words, the marginal productivity will start diminishing.

The phenomenon of diminishing returns, like that of increasing returns, rests upon the indivisibility of the fixed factor. Just as the average product of the variable factor increases in the first stage when better utilisation of the fixed indivisible factor is being made, so the average product of the variable factor diminishes in the second stage when the fixed indivisible factor is being worked too hard. Another reason offered for the operation of the law of diminishing returns is the imperfect substitutability of one factor for another. Had the perfect substitute of the scarce fixed factor been available, then the paucity of the scarce fixed factor during the second stage would have been made up by increasing the supply of

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its perfect substitute with the result that output could be expanded without 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 the law of negative returns: As the amount of the variable factor continues to be increased to a constant quantity of the other, a stage is reached when the total product declines and marginal product becomes negative. This is due to the fact that the quantity of the variable factor becomes too excessive relative to the fixed factor so that they get in each other's ways with the result that the total output falls instead of rising. In such a situation, a reduction in the units of the variable factor will increase the total output.

Stage of Operation: An important question is in which stage a rational producer will seek to produce. A rational producer will never produce in stage 3 where marginal product of the variable factor is negative. This being so, a producer can always increase his output by reducing the amount of variable factor. Even if the variable factor is free of cost, a rational producer stops before the beginning of the third stage.

A rational producer will also not produce in stage 1 as he will not be making the best use of the fixed factors and he will not be utilising fully the opportunities of increasing production by increasing the quantity of the variable factor whose average product continues to rise throughout stage 1. Even if the fixed factor is free of cost in this stage, a rational entrepreneur will continue adding more variable factors.

It is thus clear that a rational producer will never produce in stage 1 and stage 3. These stages are called stages of 'economic absurdity' or 'economic non-sense'.

A rational producer will always produce in stage 2 where both the marginal product and average product of the variable factors are diminishing. At which particular point in this stage, the producer will decide to produce depends upon the prices of factors. The optimum level of employment of the variable factor (here labour) will be determined by applying the principle of marginalism in such a way that the marginal revenue product of labour is equal to the marginal wages. (The principle of marginalism is explained in detail in the chapter discussing equilibrium in different types of markets.)

1.2.2 Returns to Scale

We shall now study about changes in output when all factors of production in a particular production function are increased together. In other words, we shall study the behaviour of output in response to a change in the scale. A change in scale means that all factors of production are increased or decreased in the same proportion. Change in scale is different

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from changes in factor proportions. Changes in output as a result of the variation in factor proportions, as seen before, form the subject matter of the law of variable proportions. On the other hand, the study of changes in output as a consequence of changes in scale forms the subject matter of returns to scale which is discussed below.It should be kept in mind that the returns to scale faced by a firm are solely technologically determined and are not influenced by economic decisions taken by the firm or by market conditions.

Returns to scale may be constant, increasing or decreasing. If we increase all factors i.e., scale in a given proportion and output increases in the same proportion, returns to scale are said to be constant. Thus, if doubling or trebling of all factors causes a doubling or trebling of output, then returns to scale are constant. But, if the increase in all factors leads to more than proportionate increase in output, returns to scale are said to be increasing. Thus, if all factors are doubled and output increases more than double, then the returns to scale are said to be increasing. On the other hand, if the increase in all factors leads to less than proportionate increase in output, returns to scale are decreasing. It is needless to say that this law operates in the long run when all the factors can be changed in the same proportion simultaneously.

It should be remembered that increasing returns to scale is not the same as increasing marginal returns. Increasing returns to scale applies to 'long run' in which all inputs can be changed. Increasing marginal returns refers to the short run in which at least one input is fixed. The existence of fixed inputs in the short run gives rise to increasing and later to diminishing marginal returns.

Constant Returns to Scale: As stated above, constant returns to scale means that with the increase in the scale in some proportion, output increases in the same proportion. Constant returns to scale, otherwise called as "Linear Homogeneous Production Function", may be expressed as follows:

$$kQx = f(kK, kL)$$

$$= k(K, L)$$

If all the inputs are increased by a certain amount (say k) output increases in the same proportion (k). It has been found that an individual firm passes through a long phase of constant returns to scale in its lifetime.

Increasing Returns to Scale: As stated earlier, increasing returns to scale means that output increases in a greater proportion than the increase in inputs. When a firm expands, increasing returns to scale are obtained in the beginning. For example, a wooden box of 3 ft. cube contains 9 times greater wood than the wooden box of 1 foot-cube. But the capacity of the 3 foot- cube box is 27 times greater than that of the one foot cube. Many such examples are found in the real world. Another reason for increasing returns to scale is the indivisibility

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of factors. Some factors are available in large and lumpy units and can, therefore, be utilised with utmost efficiency at a large output. If all the factors are perfectly divisible, increasing returns may not occur. Returns to scale may also increase because of greater possibilities of specialisation of land and machinery.

Decreasing Returns to Scale: When output increases in a smaller proportion relative to an increase in all inputs, decreasing returns to scale are said to prevail. When a firm goes on expanding by increasing all inputs, decreasing returns to scale set in. Decreasing returns to scale eventually occur because of increasing difficulties of management, coordination and control. When the firm has expanded to a very large size, it is difficult to manage it with the same efficiency as earlier.

The Cobb-Douglas production function, explained earlier is used to explain "returns to scale" in production. Originally, Cobb and Douglas assumed that returns to scale are constant. The function was constructed in such a way that the exponents summed to a+1-a=1. However, later they relaxed the requirement and rewrote the equation as follows:

$$Q = K L^{a} C^{b}$$

Where 'Q' is output, 'L' the quantity of labour and 'C' the quantity of capital, 'K' and 'a' and 'b' are positive constants.

If a + b > 1 Increasing returns to scale result i.e. increase in output is more than the proportionate increase in the use of factors (labour and capital).

a + b = 1 Constant returns to scale result i.e. the output increases in the same proportion in which factors are increased.

a + b < 1 decreasing returns to scale result i.e. the output increases less than the proportionate increase in the labour and capital.

1.3 PRODUCTION OPTIMISATION

Normally, a profit maximising firm is interested to know what combination of factors of production (or inputs) would minimise its cost of production for a given output. This can be known by combining the firm's production and cost functions, namely isoquants and iso-cost lines respectively.

Isoquants: Isoquants are similar to indifference curves in the theory of consumer behaviour. An isoquant represents all those combinations of inputs which are capable of producing the same level of output. Since an isoquant curve represents all those combination of inputs which yield an equal quantity of output, the producer is indifferent as to which combination he chooses. Therefore, Isoquants are also called equal-product curves, production

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indifference curves or iso-product curves. The concept of isoquant can be easily understood with the help of the following schedule.

Table 2 : Various combinations of X and Y to produce a given level of output

Factor combination	Factor X	Factor Y	MRTS
A	1	12	
B	2	08	4
C	3	05	3
D	4	03	2
E	5	02	1

When we plot the various combinations of factor X and factor Y, we get a curve IQ as shown in Figure 2.

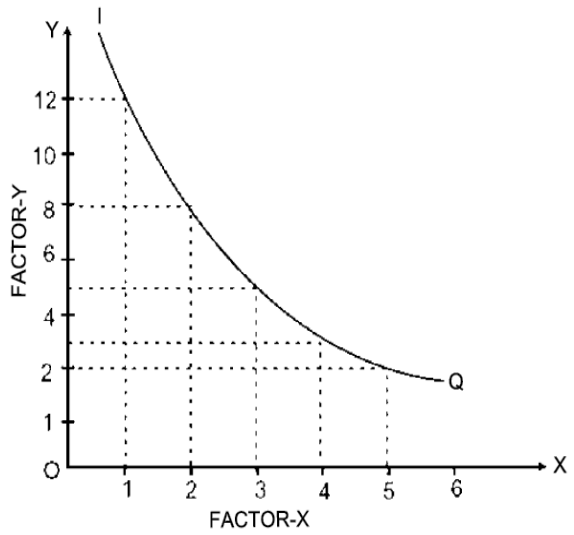

Fig. 2 : Equal Product Curve or Isoquant

Isoquants have properties similar to indifference curves. Isoquants are negatively sloped, convex to the origin due to diminishing marginal rate of technical substitution (MRTS) and are non-intersecting. However, there is one important difference between the two: whereas in an indifference curve it is not possible to quantify the level of satisfaction acquired by the consumer, the level of production acquired by the producer is easily quantified. Thus, while isoquant IQ1 represents 100 units, curves IQ2, IQ3 etc. representing higher levels of production can be drawn. While a curve on the right represents a higher level of output that on the left represents a lower level of output.

Isocost or Equal-cost Lines: Isocost line, also known as budget line or the budget constraint line, shows the various alternative combinations of two factors which the firm can buy with

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given outlay. Suppose a firm has ₹ 1,000 to spend on the two factors X and Y. If the price of factor X is ₹ 10 and that of Y is ₹ 20, the firm can spend its outlay on X and Y in various ways. It can spend the entire amount on X and thus buy 100 units of X and zero units of Y or it can spend the entire outlay on Y and buy 50 units of it with zero units of X factor. In between, it can have any combination of X and Y. Whatever be the combination of factors the firm chooses, the total cost to the firm remains the same. In other words, all points on a budget line would cost the firm the same amount.

We can show the iso-cost line diagrammatically also. The X-axis shows the units of factor X and Y-axis the units of factor Y. When the entire ₹ 1,000 is spent on factor X, we get OB of factor X and when the entire amount is spent on factor Y we get OA of factor Y. The straight line AB which joins points A and B will pass through all combinations of factors X and Y which the firm can buy with outlay of ₹ 1,000. The line AB is called iso-cost line.

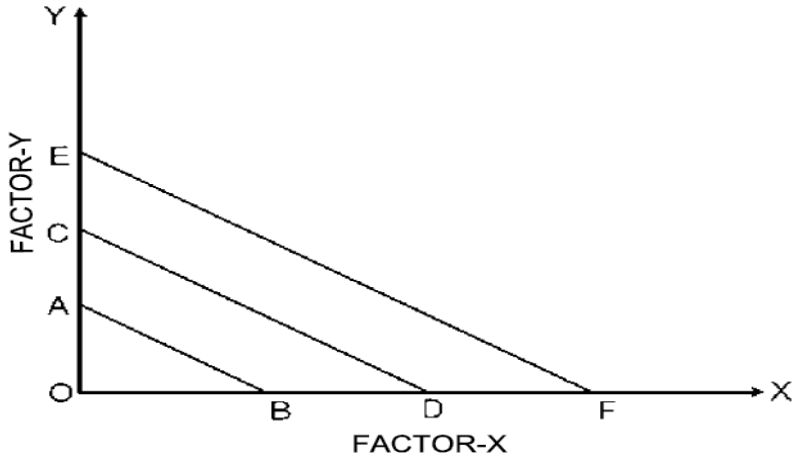

Fig. 3: Iso-cost lines

Figure 3 shows various iso-cost lines representing different combinations of factors with different outlays. Isoquants, which represent the technical conditions of production for a product and iso-cost lines which represent various 'levels of cost or outlay' (given the prices of two factors) can help the firm to optimize its production. It may try to minimise its cost for producing a given level of output or it may try to maximise the output for a given cost or outlay. Suppose the firm has already decided about the level of output to be produced. Then the question is with which factor combination the firm should try to produce the pre-decided level of output. The firm will try to use the least-cost combination of factors. The least cost combination of factors can be found by super-imposing the isoquant that represents the pre decided level of output on the iso-cost lines. This is shown in Figure 4.

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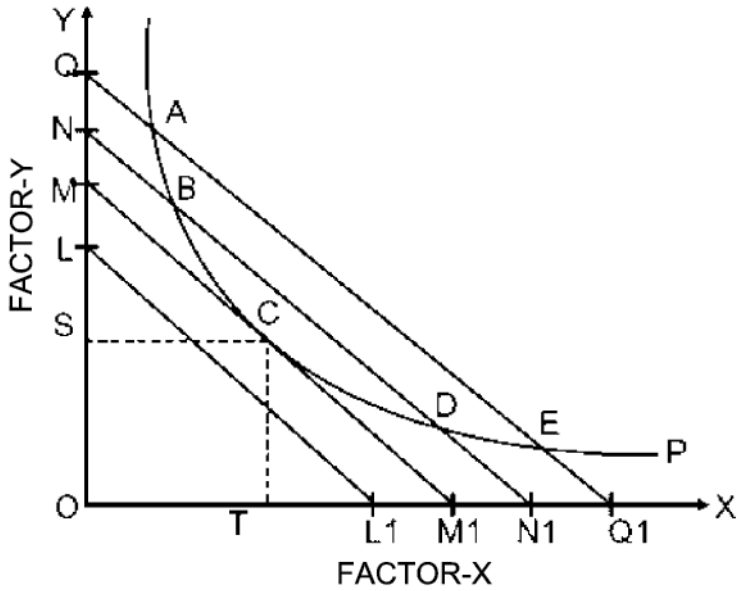

Fig. 4 : Least-cost Combination of Factors: Producer's Equilibrium

Suppose the firm has decided to produce 1,000 units (represented by iso-quant P). These units can be produced by any factor combination lying on P such as A, B, C, D, E, etc. The cost of producing 1,000 units would be minimum at the factor combination represented by point C where the iso-cost line MM1 is tangent to the given isoquant P. At all other points such as A, B, D, E the cost is more as these points lie on higher iso-cost lines Compared to MM1. Thus, the factor combination represented by point C is the optimum combination for the producer. It represents the least-cost of producing 1,000 units of output. It is thus clear that the tangency point of the given isoquant with an iso-cost line represents the least cost combination of factors for producing a given output.

SUMMARY

- Production is the outcome of the combined activity of the four factors of production viz, land, labour, capital and organization. In simple terms production, means 'creation of utility'. i.e. Utility of form, utility of place, utility of time and personal utility.
- Production does not include work done 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.
- Land includes all those free natural resources whose supply for the economy as a whole is fixed.

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- Labour is all human efforts of body or of mind undergone partly or wholly with a view to secure an income apart from the pleasure derived directly from the work.
- Capital is that part of wealth of an individual or community which is used for further production of wealth. Capital, a stock concept, refers to produced means of production and it comprises of man-made machines and materials which are used for further production.
- Capital formation, also known as investment, means a sustained increase in the stock of real capital in a country. There are mainly three stages of capital formation viz. Savings which depends on ability to save and willingness to save; Mobilisation of savings which depends on availability of financial institutions and products; and Investment i.e. the process whereby the real savings get converted into real capital assets.
- Entrepreneur is the person who organises business; initiates production, remunerates other factors of production, introduces innovations and bears the risk and uncertainties of business.
- The objectives of an enterprise may be broadly categorised under the following heads. (i) Organic objectives (ii) Economic objectives (iii) Social objectives (iv) Human objectives (v) National objectives.
- An enterprise faces a number of problems from its inception, through its life time and till its closure. These may relate to objectives, location, size, physical facilities, finance, organization structure, marketing, legal formalities and industrial relations.
- Factors of production can be divided into two categories – Fixed factors are those factors whose quantity remains unchanged with changes in output within a capacity and variable factors are those the quantity of which change with a change in the level of output.
- Production function is the technical relationship between inputs and output. Samuelson describes production function as the relationship between the maximum amount of output that can be produced and the input required to make that output. It is defined for a given state of technology.
- The law of variable proportion or the law of diminishing returns is relevant when some factors are kept fixed and others are varied. It is applicable to the short-run.
- There are three stages of the law of variable proportion – where law of increasing returns, law of diminishing returns and law of negative returns operate.
- Total product is the total output resulting from the efforts of all the factors of production combined together at any time.

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- Marginal product is the change in total product per unit change in the quantity of variable factor.
- Average product is the total product per unit of the variable factor.
- The Law of returns to scale describes the relationship between inputs and output in the long run when all inputs are changed in the same proportion. Returns to scale may be constant, increasing and decreasing.
- Constant returns to scale occur when the inputs increase by some proportion and the output also increases by the same proportion. It is also called linear homogeneous production function.
- Increasing returns to scale occur when the inputs increase by some proportion and the output increases more than proportionately.
- Decreasing returns to scale occur when the inputs increase by some proportion and the output increases less than proportionately.
- Isoquants or product indifference curves show all those combinations of different factors of production which give the same output to the producer.
- Iso-cost lines show various combinations of two factors which the firm can buy with given expenditure or outlay.
- By combining Isoquants and iso-cost lines, a producer can find out the combination of factors of production which is optimum i.e. the combination of factors of production which would minimise his cost of production.
- For producing a given output, the tangency point of the relevant isoquant (representing the output) with an iso-cost line represents the least cost combination of factors.

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UNIT - 2: THEORY OF COST

LEARNING OUTCOMES

AFTER STUDYING THIS UNIT, YOU WOULD BE ABLE TO:

- Explain the Meaning and Different Types of Costs.
- Define Cost Function and Explain the Difference between a Short-Run and Long-Run Cost Function.
- Explain the linkages between the Production Function and the Cost Function.
- Explain Economies and Diseconomies of Scale and Reasons for Their Existence.

In the previous unit, we have discussed the relationship between inputs and output in physical quantities. However, as we are aware, business decisions are generally based on cost of production i.e. the money value of inputs and output is considered. Cost analysis refers to the study of behaviour of cost in relation to one or more production criteria, namely, size of output, scale of operations, prices of factors of production and other relevant economic variables. In other words, cost analysis is concerned with the financial aspects of production relations as against physical aspects which were considered in production analysis. In order to have a clear understanding of the cost function, it is important for a businessman to understand various concepts of costs.

2.0 COST CONCEPTS

Accounting Costs and Economic costs: An entrepreneur has to pay price for the factors of production which he employs for production. He thus pays wages to workers employed, prices for the raw materials, fuel and power used, rent for the building he hires and interest on the money borrowed for doing business. All these are included in his cost of production and are termed as accounting costs. Accounting costs relate to those costs which involve cash payments by the entrepreneur of the firm. Thus, accounting costs are explicit costs and

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includes all the payments and charges made by the entrepreneur to the suppliers of various productive factors. Accounting costs are expenses already incurred by the firm. Accountants record these in the financial statements of the firm.

However, it generally happens that an entrepreneur invests a certain amount of capital in his business. If the capital invested by the entrepreneur in his business had been invested elsewhere, it would have earned a certain amount of interest or dividend. Moreover, an entrepreneur may devote his time to his own work of production and contributes his entrepreneurial and managerial ability to do business. Had he not set up his own business, he would have sold his services to others for some positive amount of money. Accounting costs do not include these costs. These costs form part of economic cost. Thus, economic costs include: (1) the normal return on money capital invested by the entrepreneur himself in his own business; (2) the wages or salary not paid to the entrepreneur, but could have been earned if the services had been sold somewhere else. Likewise, the monetary rewards for all factors owned by the entrepreneur himself and employed by him in his own business are also considered a part of economic costs. Economic costs take into account these accounting costs; in addition, they also take into account the amount of money the entrepreneur could have earned if he had invested his money and sold his own services and other factors in the next best alternative uses. Accounting costs are also called explicit costs whereas the cost of factors owned by the entrepreneur himself and employed in his own business is called implicit costs. Thus, economic costs include both accounting costs and implicit costs. Therefore, economic costs are useful for businessmen while making decisions.

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.

Outlay costs and Opportunity costs: Outlay costs involve actual expenditure of funds on, say, wages, materials, rent, interest, etc. Opportunity cost, on the other hand, 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.

A distinction between outlay costs and opportunity costs can be drawn on the basis of the nature of the sacrifice. Outlay costs involve financial expenditure at some point of time and hence are recorded in the books of account. Opportunity cost is the amount or subjective

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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.

Direct or Traceable costs and Indirect or Non-Traceable costs: Direct costs are those which have direct relationship with a component of operation like manufacturing a product, organizing a process or an activity etc. Since such costs are directly related to a product, process or machine, they may vary according to the changes occurring in these. Direct costs are costs that are readily identified and are traceable to a particular product, operation or plant. Even overhead costs can be direct as to a department; manufacturing costs can be direct to a product line, sales territory, customer class etc. We must know the purpose of cost calculation before considering whether a cost is direct or indirect.

Indirect costs are those which are not easily and definitely identifiable in 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. The economic importance of these costs is that these, even though not directly traceable to a product, may bear some functional relationship to production and may vary with output in some definite way. Examples of such costs are electric power and common costs incurred for general operation of business benefiting all products jointly.

Incremental costs and Sunk costs: Theoretically, 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 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

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facilities such as railway lines. Sunk costs act as an important barrier to entry of firms into business.

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

Private costs and Social 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 cost, on the other hand, refers to the 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.

Fixed and Variable costs: 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.

Fixed costs cannot be avoided. These costs are fixed so long as operations are going on. They can be avoided only when the operations are completely closed down. These are, by their very nature, inescapable or uncontrollable costs. But, there are some costs which will continue even after the operations are suspended, as for example, for storing of old machines which cannot be sold in the market. These are called shut down costs. Some of the fixed costs such as costs of advertising, etc. are programmed fixed costs or discretionary expenses, because they depend upon the discretion of management whether to spend on these services or not.

Variable costs are costs that are a function of output in the production period. For example, wages of casual labourers and cost of raw materials and cost of all other inputs that vary with output are variable costs. 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.

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2.1 COST FUNCTION

Cost function refers to the mathematical relation between cost of a product and the various determinants of costs. In a cost function, the dependent variable is unit cost or total cost and the independent variables are the price of a factor, the size of the output or any other relevant phenomenon which has a bearing on cost, such as technology, level of capacity utilization, efficiency and time period under consideration. 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. Cost functions are derived from actual cost data of the firms and are presented through cost curves. The shape of the cost curves depends upon the cost function. Cost functions are of two kinds: They are short-run cost functions and long-run cost functions.

2.2 SHORT RUN TOTAL COSTS

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 is incurred by a firm in the short run, whether the output is small or large. Even if the firm closes down for

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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 5.

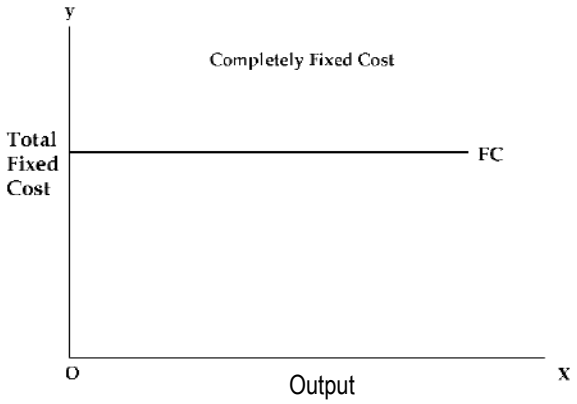

Fig. 5 : Completely Fixed Cost

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 6 presents completely variable cost curve drawn under the assumption that variable costs change linearly with changes in output.

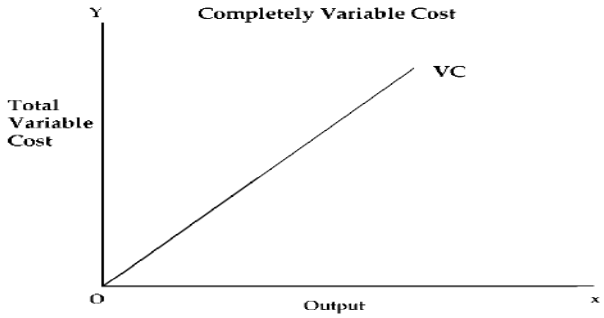

Fig. 6 : Completely Variable Cost

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 Fig. 7. Example: Electricity charges include both a fixed charge and a charge based on consumption.

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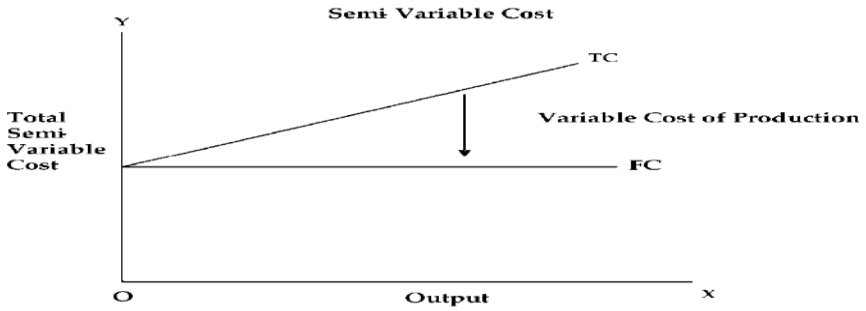

Fig. 7: Semi Variable Cost

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.

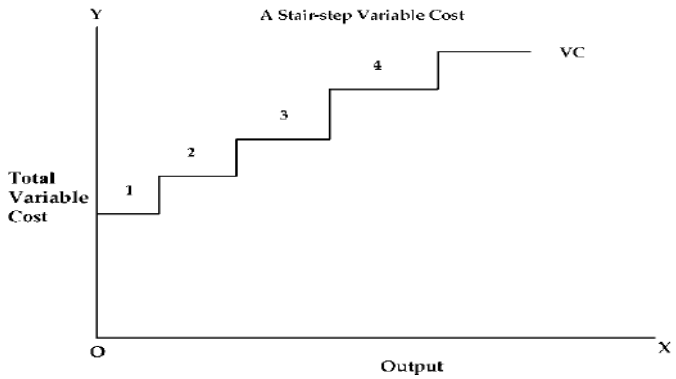

Fig. 8: A Stair-step Variable Cost

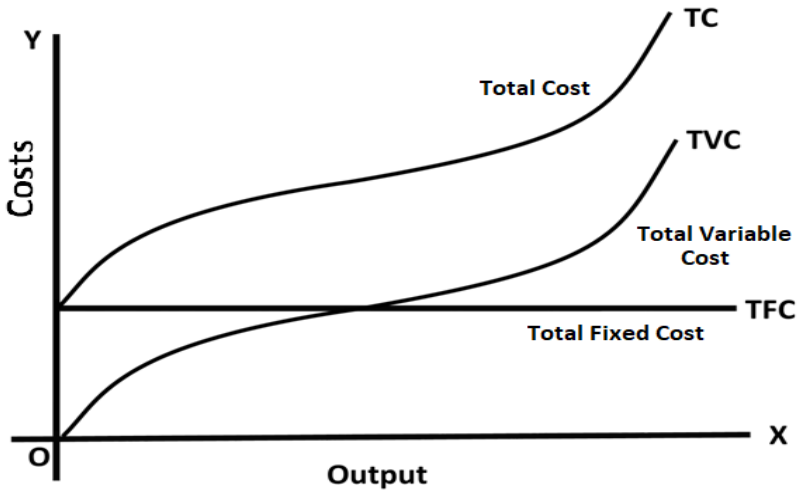

Fig. 9: Short run Total Cost Curves

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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

Average fixed cost (AFC): AFC is obtained by dividing the total fixed cost by the number of units of output produced. i.e. AFC= $\frac{TFC}{Q}$ where Q is the number of units produced. Thus, average fixed cost is the fixed cost

per unit of output. For example, if a firm is producing with a total fixed cost of ₹ 2,000/-. When output is 100 units, the average fixed cost will be ₹ 20. And now, if the output increases to 200 units, average fixed cost will be ₹ 10. Since total fixed cost is a constant amount, average fixed cost will steadily fall as output increases. 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. (Fig. 10)

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

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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. (Fig. 10)

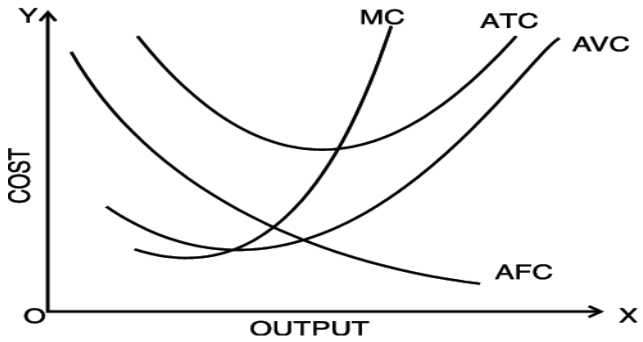

Fig. 10: Short run Average and Marginal Cost Curves

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)

Marginal cost: 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:

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

ΔTC = Change in Total cost

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ΔQ = 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 10).

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

Table 3 : 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:

(i) Fixed costs do not change with increase in output upto a given level. Average fixed cost, therefore, comes down with every increase in output.

(ii) 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.

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(iii) 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).

Figure 10 confirms the above points of relationship.

2.3 LONG RUN AVERAGE COST CURVE

As stated above, long run is a period of time during which the firm can vary all of its inputs; unlike short run in which some inputs are fixed and others are variable. In other words, whereas in the short run the firm is tied with a given plant, in the long run the firm can build any size or scale of plant and therefore, can move from one plant to another; it can acquire a big plant if it wants to increase its output and a small plant if it wants to reduce its output. The long run being a planning horizon, the firm plans ahead to build the most appropriate scale of plant to produce the future level of output. 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 11. These short run average cost curves (SACs) are also called 'plant curves'. In the short run, the firm can be operating on any short run average cost curve, given the size of the plant. Suppose that there are the only three plants which are technically possible. Given the size of the plant, the firm will be increasing or decreasing its output by changing the amount of the variable inputs. But in the long run, the firm chooses among the three possible sizes of plants as depicted by short run average curves (SAC_1, SAC_2, and SAC_3). In the long run, the firm will examine with which size of plant

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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. It will be seen from the diagram that up to OB amount of output, the firm will operate on the SAC_1, though it could also produce with SAC_2. Up to OB amount of output, the production on SAC_1 results in lower cost than on SAC_2. For example, if the level of output OA is produced with SAC_1, it will cost AL per unit and if it is produced with SAC_2 it will cost AH and we can see that AH is more than AL. Similarly, if the firm plans to produce an output which is larger than OB but less than OD, then it will not be economical to produce on SAC_1. For this, the firm will have to use SAC_2. Similarly, the firm will use SAC_3 for output larger than OD. It is thus clear that, in the long run, the firm has a choice in the employment of plant and it will employ that plant which yields minimum possible unit cost for producing a given output.

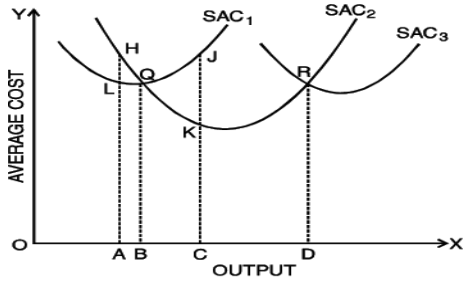

Fig. 11: Short Run Average Cost Curves

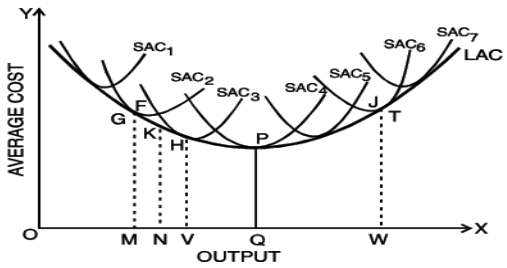

Fig. 12: Long Run Average Cost Curves

Suppose, the firm has a choice so that a plant can be varied by infinitely small gradations so that there are infinite number of plants corresponding to which there are numerous average cost curves. In such a case the long run average cost curve will be a smooth curve enveloping all these short run average cost curves.

As shown in Figure 12, the long run average cost curve is so drawn as to be tangent to each of the short run average cost curves. Every point on the long run average cost curve will be a tangency point with some short run AC curve. If a firm desires to produce any particular output, it then builds a corresponding plant and operates on the corresponding short run average cost curve. As shown in the figure, for producing OM, the corresponding point on the LAC curve is G and the short run average cost curve SAC_2 is tangent to the long run AC at this point. Thus, if a firm desires to produce output OM, the firm will construct a plant corresponding to SAC_2 and will operate on this curve at point G. Similarly, the firm will produce other levels of output choosing the plant which suits its requirements of lowest possible cost of production. 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

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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. Thus, for producing output less than "OQ" at the lowest possible unit cost, the firm will construct the relevant plant and operate it at less than its full capacity, i.e., at less than its minimum average cost of production. On the other hand, for outputs larger than OQ the firm will construct a plant and operate it beyond its optimum capacity. "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' because a firm plans to produce any output in the long run by choosing a plant on the long run average cost curve corresponding to the given output. 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: As has been seen in the diagram 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. As discussed earlier, when the firm expands, returns to scale increase. After a range of constant returns to scale, the returns to scale finally decrease. On the same line, the LAC curve first declines and then finally rises. 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. (Economies of scale will be discussed in the next section.)

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 (LAC) curve is also called the planning curve of the firm as it helps in choosing an appropriate a plant on the decided level of output. 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.

The above figure depicting long-run average cost curve is arrived at on the basis of traditional economic analysis. It is flattened 'U' shaped. This type of curve could exist only when the state of technology remains constant. But, empirical evidence shows modern firms face 'L-shaped' cost curve over a considerable quantity of output. The L-shaped long run cost curve implies that initially when the output is increased due to increase in the size of

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plant (and associated variable factors), per unit cost falls rapidly due to economies of scale. The long-run average cost curve does not increase even after a sufficiently large scale of output as it continues to enjoy economies of scale.

2.4 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:

(i) 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 specialised 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 specialisation becomes possible and as a result cost

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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 utilisation 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.

(ii) ***Managerial economies and diseconomies:*** Managerial economies refer to reduction in managerial costs. When output increases, specialisation and division of labour can be applied to management. It becomes possible to divide its management into specialised departments under specialised 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. Decentralisation of decision making and mechanisation of managerial functions further enhance the efficiency and productivity of managers. Thus, specialisation 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.

(iii) ***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

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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.

(iv) ***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.

(v) ***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

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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 specialise 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,

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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.

SUMMARY

- Cost analysis refers to the study of behaviour of cost in relation to one or more production criteria. It is concerned with the financial aspects of production.
  - Accounting costs are explicit costs and includes all the payments and charges made by the entrepreneur to the suppliers of various productive factors.
  - Economic costs take into account explicit costs as well as implicit costs. A firm has to cover its economic cost if it wants to earn normal profits.
  - Outlay costs involve actual expenditure of funds.
  - Opportunity cost is concerned with the cost of the next best alternative opportunity which was foregone in order to pursue a certain action.
  - Direct costs are those which have direct relationship with a component of operation. They are readily identified and are traceable to a particular product, operation or plant.
  - Indirect costs are those which cannot be easily and definitely identifiable in relation to a plant, product, process or department. They not visibly traceable to any specific goods, services, processes, departments or operations.
  - Incremental cost refers to the additional cost incurred by a firm as a result of a business decision.
  - Sunk costs are already incurred once and for all, and cannot be recovered.
  - Historical cost refers to the cost incurred in the past on the acquisition of a productive asset.
  - Replacement cost is the money expenditure that has to be incurred for replacing an old asset.
  - Private costs are costs actually incurred or provided for by firms and are either explicit or implicit.
  - Social cost, on the other hand, refers to the total cost borne by the society on account of a business activity and includes private cost and external cost.

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- The cost function refers to the mathematical relation between cost and the various determinants of cost. It expresses the relationship between cost and output.
- Economists are generally interested in two types of cost functions; the short run cost function and the long run cost function.
- **Short-run cost functions are**
  - Fixed or constant costs which are not a function of output. These are inescapable or uncontrollable.
  - Variable costs are a function of output in the production period.
  - 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 material, etc.
  - 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.
  - Semi-variable costs are neither perfectly variable, nor absolutely fixed in relation to the changes in the size of output.
  - Stair-step costs remain fixed over certain range of output; but suddenly jump to a new higher level when output goes beyond a given limit.
  - Total cost of a business is defined as the actual cost that must be incurred for producing a given quantity of output.
  - AFC is obtained by dividing the total fixed cost by the number of units of output produced.
  - Average variable cost is found out by dividing the total variable cost by the number of units of output produced.
  - Average total cost is the sum of average fixed cost and average variable cost.
  - Marginal cost is the addition made to the total cost by the production of an additional unit of output.
- 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.
  - The long run average cost curve, often called a planning curve, is so drawn as to be tangent to each of the short run average cost curves.

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- LAC curve is not tangent to the minimum points of the SAC curves.
- Empirical evidence shows that the state of technology changes in the long-run. Therefore, modern firms face 'L-shaped' cost curve over a considerable quantity of output.

♦ Economies of scale are of two kinds - external economies of scale and internal economies of scale.

- External economies of scale accrue to a firm due to factors which are external to a firm.
- Internal economies of scale accrue to a firm when it engages in large scale production.
- Increase in scale, beyond the optimum level, results in diseconomies of scale.

TEST YOUR KNOWLEDGE

Multiple Choice Questions

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.

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(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.*

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(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.*

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.*

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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.*

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*

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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.*

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(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.

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

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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.

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(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.*

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(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*

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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.

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(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.*

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(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 a 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.*

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(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.*

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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.*

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(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:*

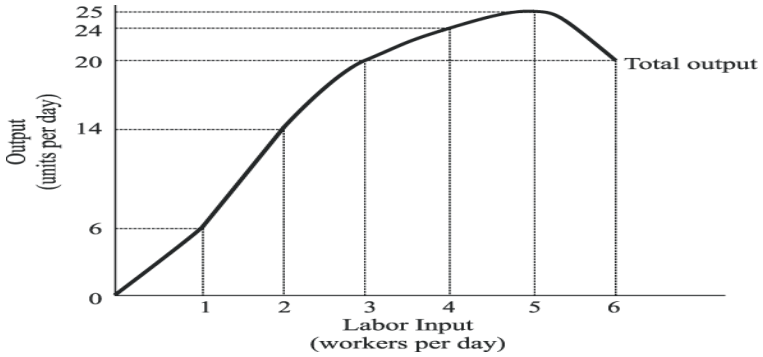
(a) *50, 50, 50, 50*

(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.*

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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.*

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(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.

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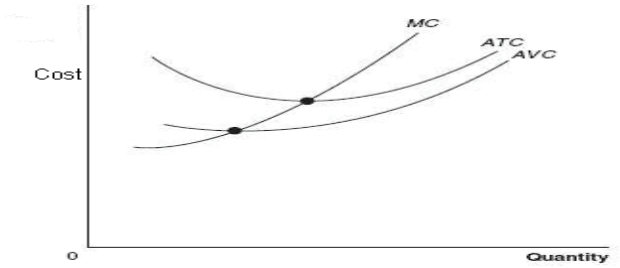
78. *In figure below, possible reason why the average variable cost curve approaches the average total cost curve as output rises is:*



(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*

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(c) *TFC*

(d) *None of the above*

83. *The falling part of long run average cost curve is tangent to the _____ of corresponding short run average cost curve(s).*

(a) *falling part*

(b) *rising part*

(c) *minimum point*

(d) *None of the above*

84. *Which one of the following is an external economies of scale in long run?*

(a) *Risk bearing economies*

(b) *Financial economies*

(c) *Development of skill labour*

(d) *None of the above*

ANSWERS

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)**	83.	**(a)**	84	**(c)**

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