UNIT - II

THEORY OF PRODUCTION AND COST ANALYSIS

DEFINITION: Production is the conversion process of Input resources into Output.
Definition:-

Introduction: The production function expresses a functional relationship between physical inputs and physical outputs of a firm at any particular time period. The output is thus a function of inputs. Mathematically production function can be written as

$$Q= f (A, B, C, D)$$

Where "Q" stands for the quantity of output and A, B, C, D are various input factors such as land, labour, capital and organization. Here output is the function of inputs. Hence output becomes the dependent variable and inputs are the independent variables.

Which shows that there is a constant relationship between applications of input (the only factor input 'X' in this case) and the amount of output (y) produced.

Production Functions:

1. When inputs are specified in physical units, production function helps to estimate the level of production.
2. It becomes is equates when different combinations of inputs yield the same level of output.
3. It indicates the manner in which the firm can substitute on input for another without altering the total output.
4. When price is taken into consideration, the production function helps to select the least combination of inputs for the desired output.
5. It considers two types' input-output relationships namely 'law of variable proportions' and 'law of returns to scale'. Law of variable propositions explains the pattern of output in the short-run as the units of variable inputs are increased to increase the output. On the other hand law of returns to scale explains the pattern of output in the long run as all the units of inputs are increased.
6. The production function explains the maximum quantity of output, which can be produced, from any chosen quantities of various inputs or the minimum quantities of various inputs that are required to produce a given quantity of output.

Production function can be fitted the particular firm or industry or for the economy as whole. Production function will change with an improvement in technology.

Assumptions:

Production function has the following assumptions.

1. The production function is related to a particular period of time.
2. There is no change in technology.
3. The producer is using the best techniques available.
4. The factors of production are divisible.
5. Production function can be fitted to a short run or to long run.

The Short Run and Long Run Production Function

The production function provides information about the quantity of factor inputs as to the result of the quantity of outputs and this is measured by total product; average product; and marginal product

I. The total product is generated from the total output from the factors of production employed by the firm. It is the quantity of output produced per time period given the inputs. The total product can easily be determined when applied to manufacturing industries for the production of cars, appliances, cellphones and other products because of clear cut measure as to the volume of production as to the tangible costs on labor and capital inputs.

II. The average product is computed through the total output divided by the number of units of the variables of the factor of production. For example, the 10 factory workers produce 1000 units of electronic components of a computer, therefore the average product of labor is 10 units of electronic components per worker. This example is generated by the output per worker employed in the factory.

III. The marginal product is the change of the total product when there is an additional unit of the input in the factors of production. The additional labor (increased in the number of workers) as an input product may increase the total product. For example, the factory intends to hire two additional workers then the 10 workers with a product of 1000 units may now increase to 1200 units. Therefore ,

the marginal product is computed by the one-unit change may result to the increase of the total product.

The Period of Production

1. Short Run Production

The short run is a period in which at least one input of the factors of production is fixed. It should be noted that usually factory facilities, equipment and machinery including land are fixed, however, the supply can be altered by changing the demand for labor, raw material, factory components and etc.

Usually a firm or producers have to pay certain production cost form the expenses such as the construction of building for the management office, manufacturing facilities, salaries or wages of the labor and other overhead costs. In the short run, the firm cost structure has to consider the fixed costs (FC) in a given period of time regardless of production level. The variable cost is associated with the production cost.

Fixed Costs- The cost of production of the investment utilized by the firm. The fixed cost does not vary regardless of the production output. These are overhead cost, rent of offices and buildings, property tax, amortization and interest.

Variable Cost- This indicates cost of the direct labor, raw materials, supplies and materials. The variable cost is associated in the production of goods.

It must be noted that the Total Costs (TC) presents the sum of the Total Variable Costs (TVC) and Total Variable Costs (TVC). This is the economic calculation of this presentation and the average cost with that of the Total Costs:

$$AC = (TFC + TVC)/Q = AFC + AVC$$

AC: average costs

TFC: total fixed costs

TVC: total variable costs

AFC: average fixed costs

AVC: average variable costs

In the short run, the total product usually responds to the increase on the use of a variable input. However, you cannot simply add factory workers just to increase the production output. There is a certain point when the marginal product could no longer increase the production output because there are too many workers to work on a fixed capital input just like machinery, equipment and facilities.

This is the reason why the Law of Diminishing Returns is present in the study of production function because the additional units of a variable inputs such as labor and raw material with a fixed land and capital may have consequence on the initial change in total output will at first rise and then fall. The marginal product of labor starts to fall when there are already so many workers producing products with fixed land, capital, equipment and etc. It can reduce the diminishing returns once there is an expansion of the land, equipment, machinery and even the increase of capital, however, we must always consider the average product and marginal product with the standard workers needed in a given number of production output.

The concept of law of diminishing returns is shown above with the production function variables of capital outlay, labor input, total output, marginal product and average product of labor. Let us assume that the fixed capital input in the short run analysis is 30 units available for the production of certain product. There is a certain point of the capital input that could maximized the marginal product, however, once it reaches the peak point the marginal product falls which may show the sign of diminishing return.

Let us take this example in the production function, the fixed capital input of 30 units may need a labor input of 6 workers that may produce 233 for the total output with a marginal product of 60 and average product of labor of 39. The marginal product of 60 is the maximize change of product for 6 workers, however, an additional workers may result to diminishing return to marginal product and eventually to the average product output.

2. Long Run Production

The period of production in the long run shows the production operation of a certain period of time. Normally, the firm expansion on the average cost of production may result the increase of production inputs. However, there are some conditions that:

a) If the firm increases or expand its production operation, is it always increases its production output.

b) Is it possible that the average cost of production may follow the same increase (to let say 50-50%) in the production input and output.

c) If the firm increases by its production input, however, the production output decreases.

The long run production for the expansion of the firm through the economies of scale illustrates the importance of capital intensive (more equipment per worker) in mass production; increased specialization and division of labor .

Three (3) Possible Cases in Long Run Period of Production

The long run period of production usually analyzes the economies of scale which studies the increasing returns to scale or economies of mass production. It tends to provided information about the unit cost and the size of operation in the production of goods. The economies of scale primarily directed to reduce the unit costs from the increasing size of the operation. That is why the larger firms are more economically viable in the long run production as it diminishes the production cost. Take note that the economies of scale tends to increase in specialization and division of labor. This may lead to increase production inputs and expands the production output.

LAWS OF RETURNS TO SCALE

1. Laws of increasing return to scale.
2. Laws of decreasing return to scale.
3. Laws of constant return to scale.

Ex: laws of return to scale

CAPITAL	LABOUR	% OF INCREASE IN INPUTS	OUTPUT	%OF INCREASE OUTPUTS	LAWS APPLICABLE
1	3		50		
2	6	100	120	140	LAW OF INCREASE
4	12	100	240	100	LAW OF CONSTANT
8	24	100	360	50	LAW OF DECREASE

i. Decreasing Returns to Scale (Increasing Cost)

When the firm becomes large it is likely to encounter problem in the production of a particular product because of the increase average cost of operation. This is the problem of management when increase of production input by 60% the production

output reaches only to 40%. In this notion the production is less cheap at a certain scale when it is already large in scale. It requires large-scale machinery or division of labor to produce greater production output.Hence, theDecreasing Returns to scale occur when the percent change in output is greater in percent for the change in inputs.

ii. Constant Returns to Scale (Constant Cost)

There is a time for a firm to enjoy a long range of production output for which the average cost is the same proportion to both production input and output. If there is an increase of the number of machines by 50% then there is also an increase of the number of units produced by 50%. This is a constant returns in machinery production.Hence, the Constant Returns to scale occur when the average cost do not increase as a result of diseconomies of scale.

iii. Increasing Return to Scale (Decreasing Cost)

This is known as the economies of scale wherein the firm's increase in all production inputs and outputs. Supposing a firm increases the inputs by 50% the return of scale increases to 60%.The economies scale expands productive capacity in the long run as it operated by machines and other sophisticated technology that may reduce the overhead cost in producing the products. This is more on capital-intensive production wherein there are more equipment utilize than workers in the production process. In the long run, the manufacturing sectors with high capital investment of equipment results to higher production output that expands the profitability of the firms. The economies of scale is the reduction of unit cost in the long run of operation. The expansion of the firm through a mass production provides greater units of output.

Cobb-Douglas production function

Production function of the linear homogenous type is invented by Junt wicksell and first tested by C. W. Cobb and P. H. Dougles in 1928. This famous statistical production function is known as Cobb-Douglas production function. Originally the function is applied on the empirical study of the American manufacturing industry. Cobb – Douglas production function takes the following mathematical form.

$$Y= (AK^{X} L^{1-x})$$

Where Y=output

K=Capital

L=Labour
A, ∞=positive constant

Assumptions:

It has the following assumptions

1. The function assumes that output is the function of two factors viz. capital and labour.
2. It is a linear homogenous production function of the first degree
3. The function assumes that the logarithm of the total output of the economy is a linear function of the logarithms of the labour force and capital stock.
4. There are constant returns to scale
5. All inputs are homogenous
6. There is perfect competition
7. There is no change in technology

ISOQUANTS

The term Isoquants is derived from the words 'iso' and 'quant' – 'Iso' means equal and 'quent' implies quantity. Isoquant therefore, means equal quantity. A family of iso-product curves or isoquants or production difference curves can represent a production function with two variable inputs, which are substitutable for one another within limits.

Iqoquants are the curves, which represent the different combinations of inputs producing a particular quantity of output. Any combination on the isoquant represents the some level of output.

For a given output level firm's production become,

$$Q= f (L, K)$$

Where 'Q', the units of output is a function of the quantity of two inputs 'L' and 'K'.

Thus an isoquant shows all possible combinations of two inputs, which are capable of producing equal or a given level of output. Since each combination yields same output, the producer becomes indifferent towards these combinations.

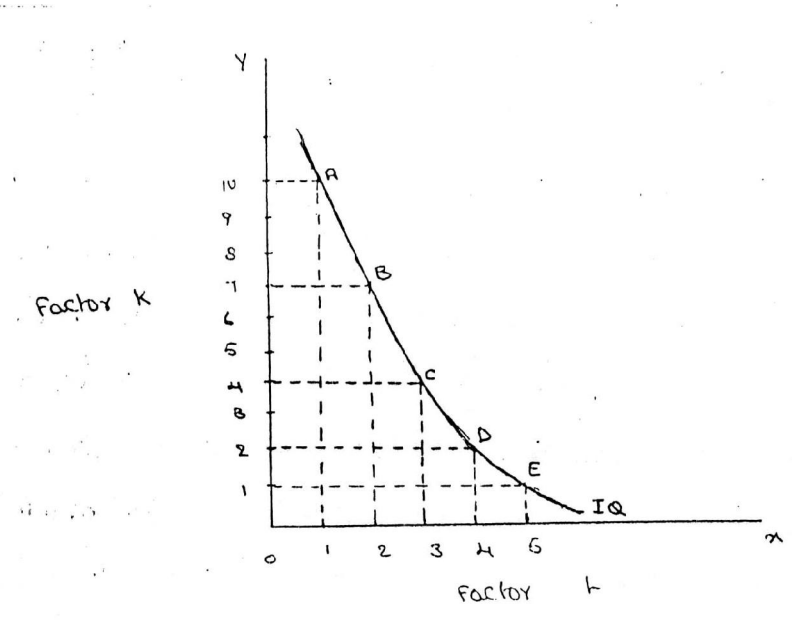
Assumptions:

1. There are only two factors of production, viz. labour and capital.
2. The two factors can substitute each other up to certain limit
3. The shape of the isoquant depends upon the extent of substitutability of the two inputs.
4. The technology is given over a period.

An isoquant may be explained with the help of an arithmetical example.

combinations	capital Rs. In lakh	number of labourers
A	1	20 -EX:20,000 UNITS
B	2	15-EX:20,000 UNITS
C	3	11- EX:20,000UNITS
D	4	8 - EX:20,000 UNITS
E	5	6- EX:20,000 UNITS
F	6	5- EX:20,000 UNITS

Combination 'A' represent 1 unit of labour and 10 units of capital and produces '50' quintals of a product all other combinations in the table are assumed to yield the same given output of a product say '50' quintals by employing any one of the alternative combinations of the two factors labour and capital. If we plot all these combinations on a paper and join them, we will get continues and smooth curve called Iso-product curve as shown below.



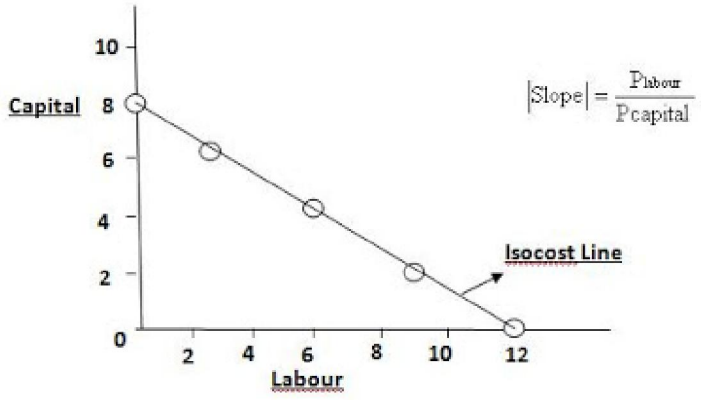
Labour is on the X-axis and capital is on the Y-axis. IQ is the ISO-Product curve which shows all the alternative combinations A, B, C, D, E which can produce 50 quintals of a product.

The Isocost

The isocost line is an important component when analysing producer's behaviour. The isocost line illustrates all the possible combinations of two factors that can be used at given costs and for a given producer's budget. In simple words, an isocost line represents a combination of inputs which all cost the same amount.

Now suppose that a producer has a total budget of Rs 120 and and for producing a certain level of output, he has to spend this amount on 2 factors A and B. Price of factors A and B are Rs 15 and Rs. 10 respectively.

Combinations	Units of Capital	Units of Labour	Total expenditure
	Price = 150Rs	Price = 100 Rs	(in Rupees)
A	8	0	120
B	6	3	120
C	4	6	120
D	2	9	120
E	0	12	120



The isocost line shows all the possible combinations of two factors Labour and capital.

MARGINAL RATE OF TECHINAL SUBSTITUTION (MRTS)

Rratio of MRTS between capital and labour:

Combinations	capital Rs. In lakh	number of Labourers	MRTS
A	1	20 - EX:20,000 UNITS	-
B	2	15- EX:20,000 UNITS	5:1
C	3	11- EX:20,000UNITS	4:1
D	4	8 - EX:20,000 UNITS	3:1
E	5	6 - EX:20,000 UNITS	2:1
F	6	5- EX:20,000 UNITS	1:1

- MRTS refers to the rate at which one input factor is substituted with the other to attain a given level of output. In other words the lesser units of one input must be compensated by increasing amounts of another input to produce the same level of output.
- MRTS is existed to produce the same level of quantity with the help of technical substitution.

ECONOMIES OF SCALE

Production may be carried on a small scale or o a large scale by a firm. When a firm expands its size of production by increasing all the factors, it secures certain advantages known as economies of production. Marshall has classified these economies of large-scale production into internal economies and external economies.

Internal economies are those, which are opened to a single factory or a single firm independently of the action of other firms. They result from an increase in the scale of output of a firm and cannot be achieved unless output increases. Hence internal economies depend solely upon the size of the firm and are different for different firms.

External economies are those benefits, which are shared in by a number of firms or industries when the scale of production in an industry or groups of industries increases. Hence external economies benefit all firms within the industry as the size of the industry expands.

Internal Economies:

Internal economies may be of the following types.

A). Technical Economies.

Technical economies arise to a firm from the use of better machines and superior techniques of production. As a result, production increases and per unit cost of production falls. A large firm, which employs costly and superior plant and equipment, enjoys a technical superiority over a small firm. Another technical economy lies in the mechanical advantage of using large machines. The cost of operating large machines is less than that of operating mall machine. More over a larger firm is able to reduce it's per unit cost of production by linking the various processes of production. Technical economies may also be associated when the large firm is able to utilize all its waste materials for the development of by-products industry. Scope for specialization is also available in a large firm. This increases the productive capacity of the firm and reduces the unit cost of production.

B). Managerial Economies:

These economies arise due to better and more elaborate management, which only the large size firms can afford. There may be a separate head for manufacturing, assembling, packing, marketing, general administration etc. Each department is under the charge of an expert. Hence the appointment of experts, division of administration into several departments, functional specialization and scientific co-ordination of various works make the management of the firm most efficient.

C). Marketing Economies:

The large firm reaps marketing or commercial economies in buying its requirements and in selling its final products. The large firm generally has a separate marketing department. It can buy and sell on behalf of the firm, when the market trends are more favorable. In the matter of buying they could enjoy advantages like preferential treatment, transport concessions, cheap credit, prompt delivery and fine relation with dealers. Similarly it sells its products more effectively for a higher margin of profit.

D). Financial Economies:

The large firm is able to secure the necessary finances either for block capital purposes or for working capital needs more easily and cheaply. It can barrow from the public, banks and other financial institutions at relatively cheaper rates. It is in this way that a large firm reaps financial economies.

E). Risk bearing Economies:

The large firm produces many commodities and serves wider areas. It is, therefore, able to absorb any shock for its existence. For example, during business depression, the prices fall for every firm. There is also a possibility for market fluctuations in a particular product of the firm. Under such circumstances the risk-bearing economies or survival economies help the bigger firm to survive business crisis.

F). Economies of Research:

A large firm possesses larger resources and can establish it's own research laboratory and employ trained research workers. The firm may even invent new production techniques for increasing its output and reducing cost.

G). Economies of welfare:

A large firm can provide better working conditions in-and out-side the factory. Facilities like subsidized canteens, crèches for the infants, recreation room, cheap houses, educational and medical facilities tend to increase the productive efficiency of the workers, which helps in raising production and reducing costs.

External Economies.

Business firm enjoys a number of external economies, which are discussed below:

A). Economies of Concentration:

When an industry is concentrated in a particular area, all the member firms reap some common economies like skilled labour, improved means of transport and communications, banking and financial services, supply of power and benefits from subsidiaries. All these facilities tend to lower the unit cost of production of all the firms in the industry.

B). Economies of Information

The industry can set up an information centre which may publish a journal and pass on information regarding the availability of raw materials, modern machines, export potentialities and provide other information needed by the firms. It will benefit all firms and reduction in their costs.

C). Economies of Welfare:

An industry is in a better position to provide welfare facilities to the workers. It may get land at concessional rates and procure special facilities from the local bodies for setting up housing colonies for the workers. It may also establish public health care units, educational institutions both general and technical so that a continuous supply of skilled labour is available to the industry. This will help the efficiency of the workers.

D). Economies of Disintegration:

The firms in an industry may also reap the economies of specialization. When an industry expands, it becomes possible to spilt up some of the processes which are taken over by specialist firms. For example, in the cotton textile industry, some firms may specialize in manufacturing thread, others in printing, still others in dyeing, some in long cloth, some in dhotis, some in shirting etc. As a result the efficiency of the firms specializing in different fields increases and the unit cost of production falls.

Thus internal economies depend upon the size of the firm and external economies depend upon the size of the industry.

DISECONOMIES OF LARGE SCALE PRODUCTION

Internal and external diseconomies are the limits to large-scale production. It is possible that expansion of a firm's output may lead to rise in costs and thus result diseconomies instead of economies. When a firm expands beyond proper limits, it is beyond the capacity of the manager to manage it efficiently. This is an example of an internal diseconomy. In the same manner, the expansion of an industry may result in diseconomies, which may be called external diseconomies. Employment of additional factors of production becomes less efficient and they are obtained at a higher cost. It is in this way that external diseconomies result as an industry expands.

The major diseconomies of large-scale production are discussed below:

Internal Diseconomies:

A). Financial Diseconomies:

For expanding business, the entrepreneur needs finance. But finance may not be easily available in the required amount at the appropriate time. Lack of finance retards the production plans thereby increasing costs of the firm.

B). Managerial diseconomies:

There are difficulties of large-scale management. Supervision becomes a difficult job. Workers do not work efficiently, wastages arise, decision-making becomes difficult, coordination between workers and management disappears and production costs increase.

C). Marketing Diseconomies:

As business is expanded, prices of the factors of production will rise. The cost will therefore rise. Raw materials may not be available in sufficient quantities due to their scarcities. Additional output may depress the price in the market. The demand for the products may fall as a result of changes in tastes and preferences of the people. Hence cost will exceed the revenue.

D). Technical Diseconomies:

There is a limit to the division of labour and splitting down of production p0rocesses. The firm may fail to operate its plant to its maximum capacity. As a result cost per unit increases. Internal diseconomies follow.

E). Diseconomies of Risk-taking:

As the scale of production of a firm expands risks also increase with it. Wrong decision by the management may adversely affect production. In large firms are affected by any disaster, natural or human, the economy will be put to strains.

External Diseconomies:

When many firm get located at a particular place, the costs of transportation increases due to congestion. The firms have to face considerable delays in getting raw materials and sending finished products to the marketing centers. The localization of industries may lead to scarcity of raw material, shortage of various factors of production like labour and capital, shortage of power, finance and equipments. All such external diseconomies tend to raise cost per unit.

COST ANALYSIS

Profit is the ultimate aim of any business and the long-run prosperity of a firm depends upon its ability to earn sustained profits. Profits are the difference between selling price and cost of production. In general the selling price is not within the control of a firm but many costs are under its control. The firm should therefore aim at controlling and minimizing cost. Since every business decision involves cost consideration, it is necessary to understand the meaning of various concepts for clear business thinking and application of right kind of costs.

COST CONCEPTS

A managerial economist must have a clear understanding of the different cost concepts for clear business thinking and proper application. The several alternative bases of classifying cost and the relevance of each for different kinds of problems are to be studied. The various relevant concepts of cost are:

1. Opportunity costs and outlay costs:

Out lay cost also known as actual costs obsolete costs are those expends which are actually incurred by the firm these are the payments made for labour, material, plant, building, machinery traveling, transporting etc., These are all those expense item appearing in the books of account, hence based on accounting cost concept.

On the other hand opportunity cost implies the earnings foregone on the next best alternative, has the present option is undertaken. This cost is often measured by assessing the alternative, which has to be scarified if the particular line is followed.

The opportunity cost concept is made use for long-run decisions. This concept is very important in capital expenditure budgeting. This concept is very important in capital expenditure budgeting. The concept is also useful for taking short-run decisions opportunity cost is the cost concept to use when the supply of inputs is strictly limited and when there is an alternative. If there is no alternative, Opportunity cost is zero. The opportunity cost of any action is therefore measured by the value of the most favorable alternative course, which had to be foregoing if that action is taken.

2. Explicit and implicit costs:

Explicit costs are those expenses that involve cash payments. These are the actual or business costs that appear in the books of accounts. These costs include payment of wages and salaries, payment for raw-materials, interest on borrowed capital funds, rent on hired land, Taxes paid etc.

Implicit costs are the costs of the factor units that are owned by the employer himself. These costs are not actually incurred but would have been incurred in the absence of employment of self – owned factors. The two normal implicit costs are depreciation, interest on capital etc. A decision maker must consider implicit costs too to find out appropriate profitability of alternatives.

3. Historical and Replacement costs:

Historical cost is the original cost of an asset. Historical cost valuation shows the cost of an asset as the original price paid for the asset acquired in the past. Historical valuation is the basis for financial accounts.

A replacement cost is the price that would have to be paid currently to replace the same asset. During periods of substantial change in the price level, historical valuation gives a poor projection of the future cost intended for managerial decision. A replacement cost is a relevant cost concept when financial statements have to be adjusted for inflation.

4. Short – run and long – run costs:

Short-run is a period during which the physical capacity of the firm remains fixed. Any increase in output during this period is possible only by using the existing physical capacity more extensively. So short run cost is that which varies with output when the plant and capital equipment in constant.

Long run costs are those, which vary with output when all inputs are variable including plant and capital equipment. Long-run cost analysis helps to take investment decisions.

5. Out-of pocket and books costs:

Out-of pocket costs also known as explicit costs are those costs that involve current cash payment. Book costs also called implicit costs do not require current cash payments. Depreciation, unpaid interest, salary of the owner is examples of back costs.

But the book costs are taken into account in determining the level dividend payable during a period. Both book costs and out-of-pocket costs are considered for all decisions. Book cost is the cost of self-owned factors of production.

6. Fixed and variable costs:

Fixed cost is that cost which remains constant for a certain level to output. It is not affected by the changes in the volume of production. But fixed cost per unit decrease, when the production is increased. Fixed cost includes salaries, Rent, Administrative expenses depreciations etc.

Variable is that which varies directly with the variation is output. An increase in total output results in an increase in total variable costs and decrease in total output results in a proportionate decline in the total variables costs. The variable cost per unit will be constant. Ex: Raw materials, labour, direct expenses, etc.

7. Post and Future costs:

Post costs also called historical costs are the actual cost incurred and recorded in the book of account these costs are useful only for valuation and not for decision making.

Future costs are costs that are expected to be incurred in the futures. They are not actual costs. They are the costs forecasted or estimated with rational methods. Future cost estimate is useful for decision making because decision are meant for future.

8. Traceable and common costs:

Traceable costs otherwise called direct cost, is one, which can be identified with a products process or product. Raw material, labour involved in production is examples of traceable cost.

Common costs are the ones that common are attributed to a particular process or product. They are incurred collectively for different processes or different types of products. It cannot be directly identified with any particular process or type of product.

9. Avoidable and unavoidable costs:

Avoidable costs are the costs, which can be reduced if the business activities of a concern are curtailed. For example, if some workers can be retrenched with a drop in a product – line, or volume or production the wages of the retrenched workers are escapable costs.

The unavoidable costs are otherwise called sunk costs. There will not be any reduction in this cost even if reduction in business activity is made. For example cost of the ideal machine capacity is unavoidable cost.

10. Controllable and uncontrollable costs:

Controllable costs are ones, which can be regulated by the executive who is in change of it. The concept of controllability of cost varies with levels of management. Direct expenses like material, labour etc. are controllable costs.

Some costs are not directly identifiable with a process of product. They are appointed to various processes or products in some proportion. This cost varies with the variation in the basis of allocation and is independent of the actions of the executive of that department. These apportioned costs are called uncontrollable costs.

11. Incremental and sunk costs:

Incremental cost also known as different cost is the additional cost due to a change in the level or nature of business activity. The change may be caused by adding a new product, adding new machinery, replacing a machine by a better one etc.

Sunk costs are those which are not altered by any change – They are the costs incurred in the past. This cost is the result of past decision, and cannot be changed by future decisions. Investments in fixed assets are examples of sunk costs.

12. Total, average and marginal costs:

Total cost is the total cash payment made for the input needed for production. It may be explicit or implicit. It is the sum total of the fixed and variable costs. Average cost is the cost per unit of output. If is obtained by dividing the total cost (TC) by the total quantity produced (Q)

$$\text{Average cost} = \frac{TC}{Q}$$

Marginal cost is the additional cost incurred to produce and additional unit of output or it is the cost of the marginal unit produced.

13. Accounting and Economics costs:

Accounting costs are the costs recorded for the purpose of preparing the balance sheet and profit and ton statements to meet the legal, financial and tax purpose of

the company. The accounting concept is a historical concept and records what has happened in the post.

Economics concept considers future costs and future revenues, which help future planning, and choice, while the accountant describes what has happened, the economics aims at projecting what will happen.

BREAK EVEN ANALYSIS

The study of cost-volume-profit relationship is often referred as BEA. The term BEA is interpreted in two senses. In its narrow sense, it is concerned with finding out BEP; BEP is the point at which total revenue is equal to total cost. It is the point of no profit, no loss. In its broad determine the probable profit at any level of production.

Assumptions:

1. All costs are classified into two – fixed and variable.
2. Fixed costs remain constant at all levels of output.
3. Variable costs vary proportionally with the volume of output.
4. Selling price per unit remains constant in spite of competition or change in the volume of production.
5. There will be no change in operating efficiency.
6. There will be no change in the general price level.
7. Volume of production is the only factor affecting the cost.
8. Volume of sales and volume of production are equal. Hence there is no unsold stock.
9. There is only one product or in the case of multiple products. Sales mix remains constant.

Merits:

1. Information provided by the Break Even Chart can be understood more easily then those contained in the profit and Loss Account and the cost statement.
2. Break Even Chart discloses the relationship between cost, volume and profit. It reveals how changes in profit. So, it helps management in decision-making.
3. It is very useful for forecasting costs and profits long term planning and growth
4. The chart discloses profits at various levels of production.
5. It serves as a useful tool for cost control.
6. It can also be used to study the comparative plant efficiencies of the industry.

7. Analytical Break-even chart present the different elements, in the costs – direct material, direct labour, fixed and variable overheads.

Demerits:

1. Break-even chart presents only cost volume profits. It ignores other considerations such as capital amount, marketing aspects and effect of government policy etc., which are necessary in decision making.
2. It is assumed that sales, total cost and fixed cost can be represented as straight lines. In actual practice, this may not be so.
3. It assumes that profit is a function of output. This is not always true. The firm may increase the profit without increasing its output.
4. A major draw back of BEC is its inability to handle production and sale of multiple products.
5. It is difficult to handle selling costs such as advertisement and sale promotion in BEC.
6. It ignores economics of scale in production.
7. Fixed costs do not remain constant in the long run.
8. Semi-variable costs are completely ignored.
9. It assumes production is equal to sale. It is not always true because generally there may be opening stock.
10. When production increases variable cost per unit may not remain constant but may reduce on account of bulk buying etc.
11. The assumption of static nature of business and economic activities is a well-known defect of BEC.

REQUIRED TERMS TO DETERMONE THE BREAK EVEN POINT

1. Fixed cost
2. Variable cost
3. Contribution
4. Margin of safety
5. Angle of incidence
6. Profit volume ratio
7. Break-Even-Point

1. ***Fixed cost:*** Expenses that do not vary with the volume of production are known as fixed expenses. Eg. Manager's salary, rent and taxes, insurance etc. It should be noted that fixed changes are fixed only within a certain range of plant capacity. The concept of fixed overhead is most useful in formulating a price fixing policy. Fixed cost per unit is not fixed.
2. ***Variable Cost:*** Expenses that vary almost in direct proportion to the volume of production of sales are called variable expenses. Eg. Electric power and fuel,

packing materials consumable stores. It should be noted that variable cost per unit is fixed.

3. ***Contribution:*** Contribution is the difference between sales and variable costs and it contributed towards fixed costs and profit. It helps in sales and pricing policies and measuring the profitability of different proposals. Contribution is a sure test to decide whether a product is worthwhile to be continued among different products.

   Contribution = Sales – Variable cost
   Contribution = Fixed Cost + Profit.

4. ***Margin of safety:*** Margin of safety is the excess of sales over the break even sales. It can be expressed in absolute sales amount or in percentage. It indicates the extent to which the sales can be reduced without resulting in loss. A large margin of safety indicates the soundness of the business. The formula for the margin of safety is:

   Present sales – Break even sales **or** $\frac{\text{Profit}}{\text{P. V. ratio}}$

   Margin of safety can be improved by taking the following steps.
   1. Increasing production
   2. Increasing selling price
   3. Reducing the fixed or the variable costs or both
   4. Substituting unprofitable product with profitable one.

5. ***Angle of incidence:*** This is the angle between sales line and total cost line at the Break-even point. It indicates the profit earning capacity of the concern. Large angle of incidence indicates a high rate of profit; a small angle indicates a low rate of earnings. To improve this angle, contribution should be increased either by raising the selling price and/or by reducing variable cost. It also indicates as to what extent the output and sales price can be changed to attain a desired amount of profit.

6. ***Profit Volume Ratio*** is usually called P. V. ratio. It is one of the most useful ratios for studying the profitability of business. The ratio of contribution to sales is the P/V ratio. It may be expressed in percentage. Therefore, every organization tries to improve the P. V. ratio of each product by reducing the variable cost per unit or by increasing the selling price per unit. The concept of P. V. ratio helps in determining break even-point, a desired amount of profit etc.

   The formula is, $\frac{\text{Contribution}}{Sales}$ X 100

7. *Break – Even- Point:* If we divide the term into three words, then it does not require further explanation.

Break-divide

Even-equal

Point-place or position

Break Even Point refers to the point where total cost is equal to total revenue. It is a point of no profit, no loss. This is also a minimum point of no profit, no loss. This is also a minimum point of production where total costs are recovered. If sales go up beyond the Break Even Point, organization makes a profit. If they come down, a loss is incurred.

1. Break Even point (Units) = $\frac{\text{Fixed Expenses}}{\text{Contribution per unit}}$
2. Break Even point (In Rupees) = $\frac{\text{Fixed expenses}}{\text{Contribution}}$ X sales

QUESTIONS

1. Why does the law of diminishing returns operate? Explain with the help of a diagram.
2. Explain the nature and uses of production function.
3. Explain and illustrate lows of returns to scale.
4. a. Explain how production function can be mode use of to reduce cost of Production.
   b. Explain low of constant returns? Illustrate.
5. Explain the following (i) Internal Economics (ii) External Economics (or) Explain Economics of scale. Explain the factor, which causes increasing returns to scale.
6. Explain the following with reference to production functions
   (a) MRTS
   (b) Variable proportion of factor
7. Define production function, explain is equate and is cost curves.
8. Explain the importance and uses of production function in break-even analysis.
9. Discuss the equilibrium of a firm with isoquants.
10. (a) What are isocost curves and iso quants? Do they interest each other
    (b) Explain Cobb-Douglas Production function.What cost concepts are mainly used for management decision making? Illustrate.

11. The PV ratio of matrix books Ltd Rs. 40% and the margin of safety Rs. 30. You are required to work out the BEP and Net Profit. If the sales volume is Rs. 14000/-

12. A Company reported the following results for two period

Period	Sales	Profit

I	Rs. 20,00,000	Rs. 2,00,000
II	Rs. 25,00,000	Rs. 3,00,000

Ascertain the BEP, PV ratio, fixes cost and Margin of Safety.

13. Write short notes on the following
    (a) Profit – Volume ratio
    (b) Margin of Safety

14. Write short notes on: (i) Suck costs (ii) Abandonment costs

15. The information about Raj & Co are given below:
    PV ratio : 20%
    Fixed Cost : Rs. 36,000/-
    Selling Price Per Unit: Rs. 150/-
    Calculate (i) BEP in rupees (ii) BEP in Units
    (iii) Variable cost per unit
    (iv) Contribution per unit

16. Define opportunity cost. List out its assumptions & Limitation.

17. (a) Explain the utility of BEA in managerial decision making
    (b) How do you explain break even chart? Explain.

9. Write short motes on:
    (i) Fixed cost & variable cost
    (ii) Out of pocket costs & imputed costs
    (iii) Explicit & implicit Costs
    (iv) Short rum cost

10. Write short note on the following:
    (a) PV ratio
    (b) Margin of Safety
    (c) Angle of incidence
    (d)

18. Explain Cost/Output relationship in the short run.

19. Appraise the usefulness of BEA for a multi product organization

20. Describe the BEP with the help of a diagram and its uses in business decision making.

21. If sales in 10000 units and selling price Rs. 20/- per unit. Variable cost is Rs. 10/- per unit and fixed cost is Rs. 80000. Find out BEP in Units and sales revenue what is profit earned? What should be the sales for earning a profit of Rs. 60000/-

22. How do you determine BEP in terms of physical units and sales value? Explain the concepts of margin of safety & angle of incidence.

23. Sales are 1,10,000 producing a profit of Rs. 4000/- in period I, sales are 150000 producing a profit of Rs. 12000/- in period II. Determine BEP & fixed expenses.

24. When a Mc change does Ac changed (a) at the same rate (b) at a higher rate or (c) at a lower rate? Illustrate your answer with a diagram.

25. Explain the relationship between MC, AC and TC assuming a short run non-linear cost function.

26. Sale of a product amounts to 20 units per months at Rs. 10/- per unit. Fixed overheads is Rs. 400/- per month and variable cost is Rs. 6/- per unit. There is a proposal to reduce prices by 107. Calculate present and future P-V ratio. How many units must be sold to earn a target profit of present level?

QUIZ

1. How many types of input-output relations discussed by the Law of production. ( )
   (a) Five (b) Four
   (c) Two (d) Three
2. How many stages are there in 'Law of Variable Proportions'? ( )
   (a) Five (b) Two
   (c) Three (d) Four

3. Congregation of body of persons assembling together to work at a certain Time and place is called as ( )
   (a) Firm (b) Industry
   (c) Plant (d) Size

4. When a firm expands its Size of production by increasing all factors, It secures certain advantages, known as ( )
   (a) Optimum Size (b) Diseconomies of Scale
   (c) Economies of Scale (d) None

5. When producer secures maximum output with the least cost combination Of factors of production, it is known as_____ ( )
   (a) Consumer's Equilibrium (b) Price Equilibrium
   (c) Producer's Equilibrium (d) Firm's Equilibrium

6. The 'Law of Variable Proportions' is also called as _____. ( )
   (a) Law of fixed proportions (b) Law of returns to scale
   (c) Law of variable proportions (d) None

7. _____ Is a 'group of firms producing the same are slightly Different products for the same market or using same raw material'. ( )
(a) Plant (b) Firm
(c) Industry (d) Size

8. When proportionate increase in all inputs results in an equal Proportionate increase in output, then we call_____. ( )
(a) Increasing Returns to Scale (b) Decreasing Returns to Scale
(c) Constant Returns to Scale (d) None

9. When different combinations of inputs yield the same level of output Known as _____. ( )
(a) Different Quants (b) Output differentiation
(c) Isoquants (d) Production differentiation

10. Conversion of inputs in to output is called as _____. ( )
(a) Sales (b) Income
(c) Production (d) Expenditure

11. When Proportionate increase in all inputs results in more than equal Proportionate increase in output, then we call _____. ( )
(a) Decreasing Returns to Scale (b) Constant Returns to Scale
(c) Increasing Returns to Scale (d) None

12. When Proportionate increase in all inputs results in less than Equal Proportionate increase in output, then we call _____. ( )
(a) Increasing Returns to Scale (b) Constant Returns to Scale
(c) Decreasing Returns to Scale (d) None

13. A curve showing equal amount of outlay with varying Proportions of Two inputs are called _____. ( )
(a) Total Cost Curve (b) Variable Cost Curve
(c) Isocost Curve (d) Marginal Cost Curve

14. The cost of best alternative forgone is_____ ( )
(a) Outlay cost (b) Past cost
(c) Opportunity cost (d) Future cost

15. If we add up total fixed cost (TFC) and total variable cost (TVC), we get__ ( )
(a) Average cost (b) Marginal cost
(c) Total cost (d) Future cost

16. _____ costs are theoretical costs, which are not recognized by the Accounting system. ( )
(a) Past (b) Explicit
(c) Implicit (d) Historical

17. _____cost is the additional cost to produce an additional unit of output. ( )
(a) Incremental (b) Sunk
(c) Marginal (d) Total

18. _____ costs are the costs, which are varies with the level of output. ( )
(a) Fixed (b) Past
(c) Variable (d) Historical

19. _____ costs are those business costs, which do not Involve any cash payment. ( )
(a) Past (b) Historical
(c) Implicit (d) Explicit

20. The opposite of Past cost is _____. ( )
(a) Historical (b) Fixed cost
(c) Future cost (d) Variable cost

21. _____ is a period during which the existing physical capacity of the Firm can be changed. ( )
(a) Market period (b) Short period
(c) Long period (d) Medium period

22. What is the formula for Profit-Volume Ratio? ( )

(a) $\frac{\text{Sales}}{\text{Contribution}} \times 100$ (b) $\frac{\text{Variable cost}}{\text{Sales}} \times 100$

(c) $\frac{\text{Contribution}}{\text{Sales}} \times 100$ (b) $\frac{\text{Fixed cost}}{\text{Sales}} \times 100$

23. _____ is a point of sales at which there is neither profit nor loss. ( )
(a) Maximum sales (b) Minimum sales
(c) Break-Even sales (d) Average sales

24. What is the formula for Margin of Safety? ( )
(a) Break Even sales – Actual sales (b) Maximum sales – Actual sales
(c) Actual sales – Break Even sales (d) Actual sales – Minimum sales

25. What is the formula for Break-Even Point in Units? ( )
(a) $\frac{\text{Contribution}}{\text{Selling Price per unit}}$ (b) $\frac{\text{Variable cost}}{\text{Contribution per unit}}$
(c) $\frac{\text{Fixed cost}}{\text{Contribution per unit}}$ (d) $\frac{\text{Variable cost}}{\text{Selling Price per unit}}$

26. What is the Other Name of Profit Volume Ratio? ( )
(a) Cost-Volume-Profit Ratio (b) Margin of safety Ratio

(c) Marginal Ratio (d) None

27. What is the break-even sales amount, when selling price per unit is 10/- , Variable cost per unit is 6/- and fixed cost is 40,000/-. ( )
(a) Rs. 4, 00,000/- (b) Rs. 3, 00,000/-
(c) Rs. 1, 00,000/- (d) Rs. 2, 00,000/-

28. 'Contribution" is the excess amount of Actual Sales over _____. ( )
(a) Fixed cost (b) Sales
(c) Variable cost (d) Total cost

Note: Answer is "C" for all the above questions.