Theories of Production and Cost analyses

Unit - II

UNIT II

Theories of Production and Cost Analyses: Theories of Production function-Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

MEANING OF PRODUCTION

- Production means a process to change the raw materials into final goods (or) finished goods.

- But in economics making of the goods (or) creation of goods (material and immaterial) for the purpose of selling them in the market is called production.

- Production is the result of the collective efforts of the four factors of production land, labour, capital and organization

FACTORS OF PRODUCTION AND ITS CLASSIFICATION

- **Land:**

- Land in common usage is soil or surface of the earth. As a factor of production it refers to all natural resources like forests, water, climate, minerals etc. It mainly supplies food to people, provides space for work and supplies raw material to industry.

- **Labour**

- In the ordinary usage, labour stands for only physical labour. In economics, labour means physical as well as mental services engaged in production to earn income. Classical economists and Karl Marx have considered labour as the sole factor of production.

- **Capital:**

- In the ordinary sense capital means money for an individual or a firm. Money is a form of capital when it is used to purchase machinery, tools, raw materials etc. Ultimately it is these man made goods i.e. Machinery, tools etc. that help in the production of goods. These are vital in raising productivity in different sectors.

- **Entrepreneur**:

- The person who organizes the production is called an entrepreneur. He is considered as a separate factor because he performs specific functions different from those of other factors. Now-a-days an entrepreneur is not considered as a separate factor but as special types of human labourer. Whenever the ownership and the management are one and the same entrepreneur has to perform certain specific functions.

Production function

Production function explains the functional relationship between inputs and output. To get a certain amount of output what combination of inputs are required will be given by the production function. For example

Q = f (K, N, L .... E)

Where, Q = output

f = Function

K = Capital

N = Labour

L = Land

E = Other inputs

Assumptions of Production function

- 1. The level of technology remains constant.

- 2. The production function relates to a particular period.

- 3. The factors of production are divided into small.

- 4. The firm uses the best and most efficient technique.

- To construct a builiding what combinations of inputs are required are given by engineers and economists make assumptions through deductive logic formulated theories and arrive at a meaningful conclusions.

Managerial uses of Production function

- a. Helpful in determining least cost combination.
- b. It helps to determine optimum level of output.
- c. Useful in drafting plans.
- d. Supports in taking cost control decisions.

Types of production functions:

- Before analyzing the types of production-function it will be useful to understand the meaning of following important terms

- 1. Short period production functions:

- It shows the relationship between production and factors of production in the short period. In the short period all factors may not be available, so the factors of production in the short period can be divided into two types they are:-

- 1. Fixed factors

- 2. Variable factors

- 1**. Fixed factors:**

- The factors which are not available in the short period they can be kept as constant. So they are called fixed factors.

- Example: land, building, machines etc.

- 2. **Variable factors**:

- The factors which are available to change the output in the short period, they can be changed so they are called variable factors

- Example: capital, labour, raw materials etc.

- 2. Long period production function:

- It explains the relationship between production and factors of production in the long period. It is also called as law of return to scale.

- • The classification of fixed and variable factors is related to only short period. But in long period all factors are variable factors

LAW OF VARIABLE PROPORTION

- Law of variable proportions (LVP) states that as we increase quantity of only one input keeping other inputs fixed, total product (TP) initially increases at an increasing rate, then at a decreasing rate and finally at a negative rate.

- The changes in TP and MP (Marginal production) can be classified into following three phases:

  - Phase I : TP rises at increasing rate and MP increases

  - Phase II: TP rises at decreasing rate MP decreases and is positive

  - Phase III: TP falls MP becomes negative

- It explains the relationship between inputs and outputs in the short period. According to this law output can be changed by changing some factors (variable factors) while other factors are constant. So it is called law of variable proportions. This law was developed by "Alfred Marshall".

- Definition:

- "An increase in the amount of labour and capital applied in the cultivation of land causes in general a less than proportionate increase in the amount of output raised unless it happens to coincide with the improvements in the arts of agriculture". – Marshall

- **Concepts in this law:**
- Total product:
- (1) Total Product - It refers to the total output of the firm per period of time
- (2) Average Product - Average Product is total output per unit of the variable input. Thus Average Product is total product divided by the number of units of the variable factor.
- $AP = Q/L$ where Q is Total Product, L is the quantity of labour.
- (3) Marginal Product - Marginal Product is the change in total product resulting from using an additional unit of the variable factor.
- $MP = dQ/dL$, where d is the rate of change
- It is the total amount of the output obtained by the firm 'or' producer by the employment of total units of factors of production (labour). When the marginal productivities of labour added then total productivity can be obtained
- $TP = f[ql]$ (or) $TP = \sum mp$

- **Average product:**
- It is the product per unit of labour when the total product is divided with no. of units of labour average product can be obtained.
- $\qquad$ TP

  $Ap = \text{-------}$
- $\qquad$ L
- **Marginal Product:**
- It is an additional product obtained by the firm or producer by the employment of additional unit of labour or one more unit of labour. The change in the total product is also called marginal product.
- $\qquad$ ΔTP
- $MP = \text{------}$
- $\qquad$ ΔL
- $MP = TP_n - TP_{n-1}$

Explanation of the law

Marshall explained this law with an example. He applied this law in the cultivation of land. According to this law when land is kept as constant and go on increasing the labour in the first stage increasing returns, second stage diminishing returns, and third stage negative returns are occurred. This can be explained by the following table.   Units of labour Total product Average product Marginal product

Table 1.

Units of Land	Units of Labour	Total Production	Average Production	Marginal Production	
10 Acres	0	–	–	–	
,,	1	20	20	20	
,,	2	50	25	30	1st stage
,,	3	90	30	40	MP > AP
,,	4	120	30	30 } AP = MP	
,,	5	140	28	20	
,,	6	150	25	10	2nd stage
,,	7	150	21.3	0	MP=0 and TP Maximum
,,	8	140	17.5	–10 } 3rd stage MP < 0	

Diagrametic explaination

Production Functions

Table 1.

Units of Land	Units of Labour	Total Production	Average Production	Marginal Production	
10 Acres	0	–	–	–	
"	1	20	20	20	
"	2	50	25	30	1st stage
"	3	90	30	40	MP > AP
"	4	120	30	30	AP = MP
"	5	140	28	20	
"	6	150	25	10	2nd stage
"	7	150	21.3	0	MP=0 and TP Maximum
"	8	140	17.5	–10	3rd stage MP < 0

- **Main points in this law:**

- In the 1st stage the T.P, A.P, M.P go on increasing but at the end of the 1st stage M.P starts to decline. The 1st stage was end when the M.P is equal to A.P.

- In the 2nd stage T.P goes on increasing but it increases with diminishing rate. A.P goes on diminishing.

- M.P also goes on diminishing at the end of the 2nd stage the T.P reached the maximum. When the T.P is maximum then the M.P is zero. It intersects the x-axis.

- In the 3rd stage the T.P and A.P go on diminishing but for the M.P becomes negative so the M.P curves crossed the x-axis.

- The M.P curve intersects the A.P curve when the A.P is maximum

- The law of variable proportions is also called "law of diminishing marginal returns".
- • This law is not only applicable to agriculture sector but also applicable to industrial sector, service sector etc.
- **Reasons for the diminishing returns:**
- • All units of variable factors are not homogenous.
- • Imperfect substitutions.
- • The combination becomes wrong.

- **Importance:**
- • This law is useful to firm (or) producer for the decision making regarding the output.
- • According to this law the firm (or) producer operates only in second stage. He never chooses the either first stage (or) third stage.
- **Assumptions:**
- • The units of the variable factor are homogenous.
- • There is a possibility to change the some factors (Variable factors), while other factors are constants (fixed factors).
- • There is a possibility to change the combination of fixed and variable factors.
- • There must be no change in the level of technology.
- • It is applicable to only short period

Isoquants

- Iso means equal and quant means quantity. i.e., equal quantity.
- Irrespective of the labour and capital, equal quantity of output will be produced.
- Therefore, an isoquant represents a constant quantity of output. The isoquant curve is also known as an "Equal Product Curve" or "Production Indifference Curve" or Iso-Product Curve."
- Production function for isoquants are Q= f(l,k)
- Q = Quantity of the output produced by the company
- f = function
- l = labour
- k = capital

Assumptions

- Only 2 factors of production (Labour and Capital)
- 2 factors can substitute each other upto some limit

- Irrespective of labour and capital, how many ever units they may be used quantity produced is the same.
- (A given quantity of output may be produced with different combinations of factors.)

- **Assumptions:**
- The main assumptions of Iso-quant curves are as follows:
- 1**. Two Factors of Production:**

   Only two factors are used to produce a commodity.

- 2. **Divisible Factor:**

   Factors of production can be divided into small parts.

- 3**. Constant Technique:**

   Technique of production is constant or is known before hand.

- 4. **Possibility of Technical Substitution:**

 The substitution between the two factors is technically possible. That is, production function is of 'variable proportion' rather than fixed proportion.

- 5. **Efficient Combinations:**

  Under the given technique, factors of production can be used with maximum efficiency.

Table 1. Iso-Product Schedule.

Combination	Units of labour	Units of capital	Output of cloth (metres)
A	1	15	200
B	2	11	200
C	3	8	200
D	4	6	200
E	5	5	200

Fig. 1.
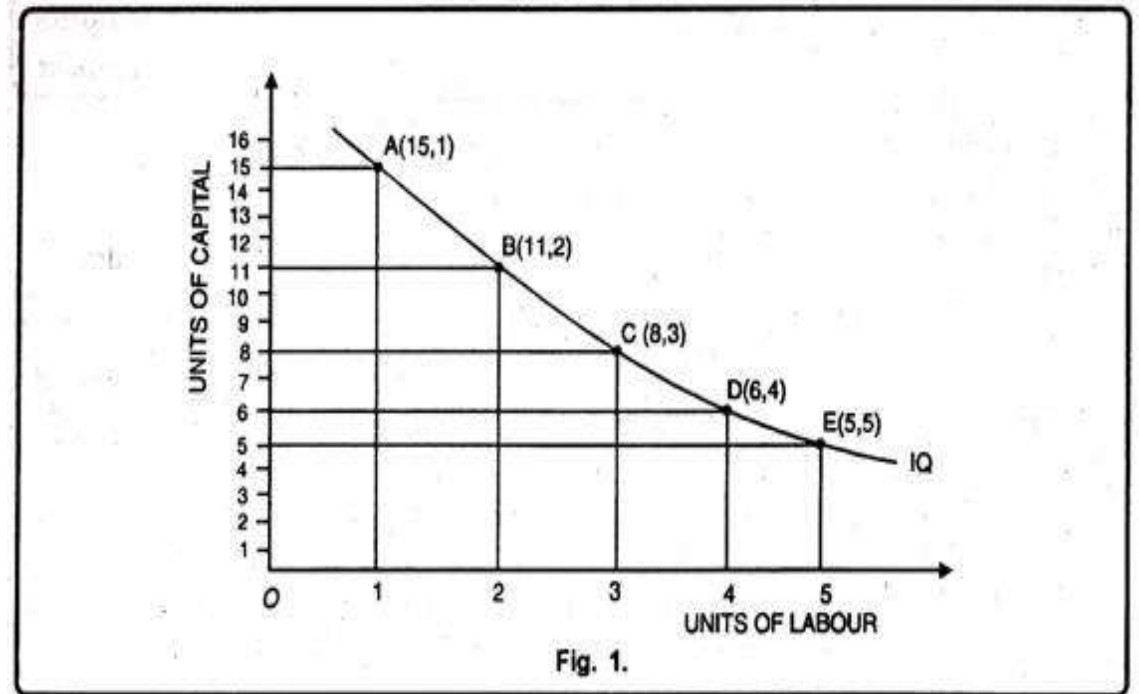
- An Iso-quant curve may be defined as a curve showing the possible combinations of two variable factors that can be used to produce the same total product." Peterson

- "Iso-product curve shows the different input combinations that will produce a given output." Samuelson
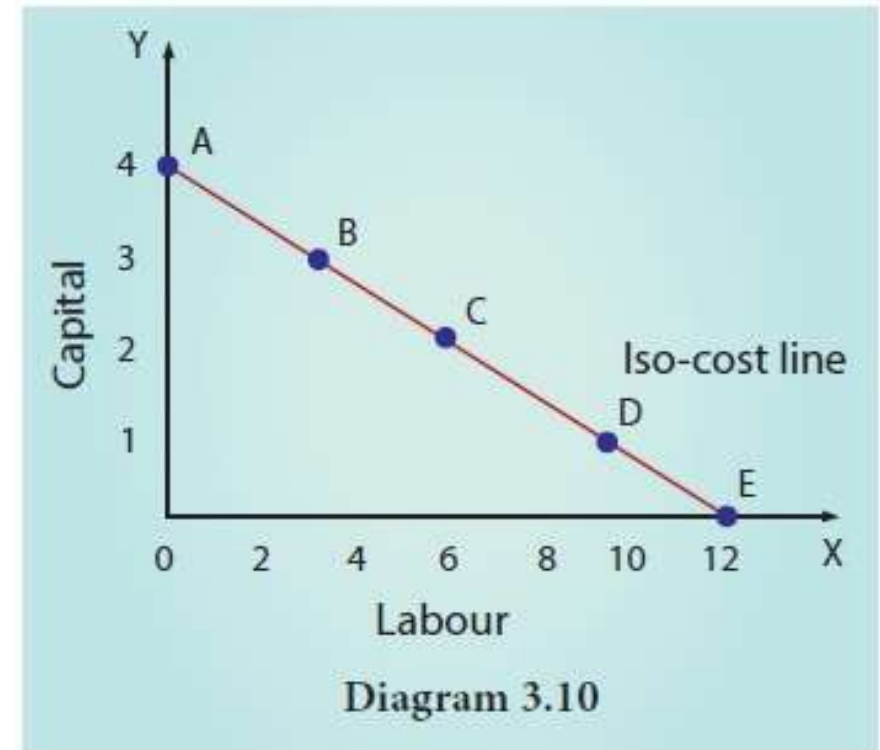

Fig. 2
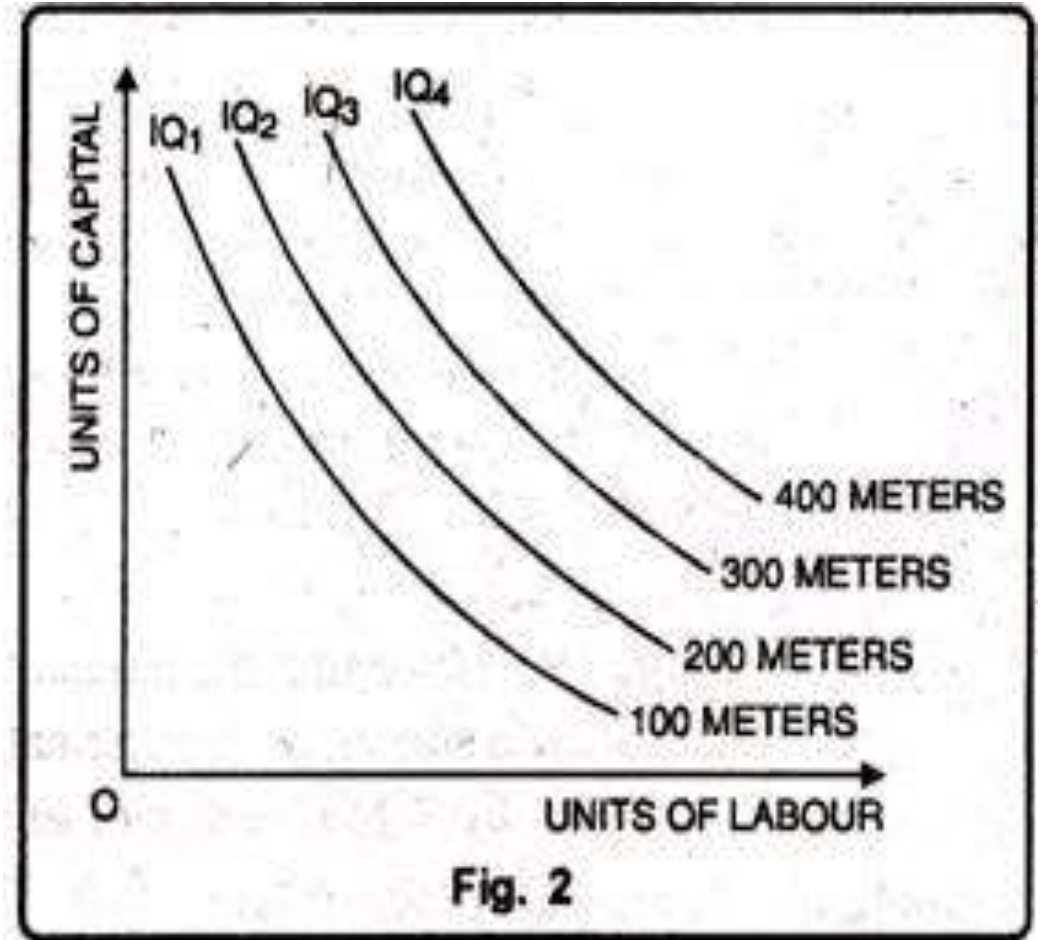
Isocosts

- Iso means equal and cost means price. i.e., equal price.
- Production function for isocost is
- TC = (wl) + (rk)
- TC = Total cost
- W = Wage
- L = Labour
- R = Cost of capital
- K = Capital

- An isoquant shows what a firm is desirous of producing. But, the desire to produce a commodity is not enough. The producer must have sufficient capacity to buy necessary factor inputs to be able to reach its desired production level. The capacity of the producer is shown by his monetary resources, i.e., his cost outlay (or how much money he is capable of spending) on capital and labour, the prices of which are taken as constant, i.e., given in the market place.

- So, like the consumer the producer has also to operate under a budget (resource) constraint. This is picturised by his budget line called isocost line. To find the least cost combination of inputs to produce a given output, we need to construct such equal cost lines or isocost lines.

- An isocost line is a locus of points showing the alternative combinations of factors that can be purchased with a fixed amount of money.

- The price of a factor of production is extremely important in this decision.

- In order to minimize costs and produce efficiently, the firm must know exactly what its costs will be.

Table 3.3 The Iso-cost

Combinations	Units of Capital Price = ₹30	Units of Labour Price = ₹10	Total Expenditure (in Rupees)
A	4	0	120
B	3	3	120
C	2	6	120
D	1	9	120
E	0	12	120

Diagram 3.10

- Both isocosts and isoquants are curves plotted on a graph. Used by producers and manufacturers, they display the best interplay of two factors that will result in the maximum output at minimum cost. An isoquant shows all combinations of factors that produce a certain output. An isocost show all combinations of factors that cost the same amount.
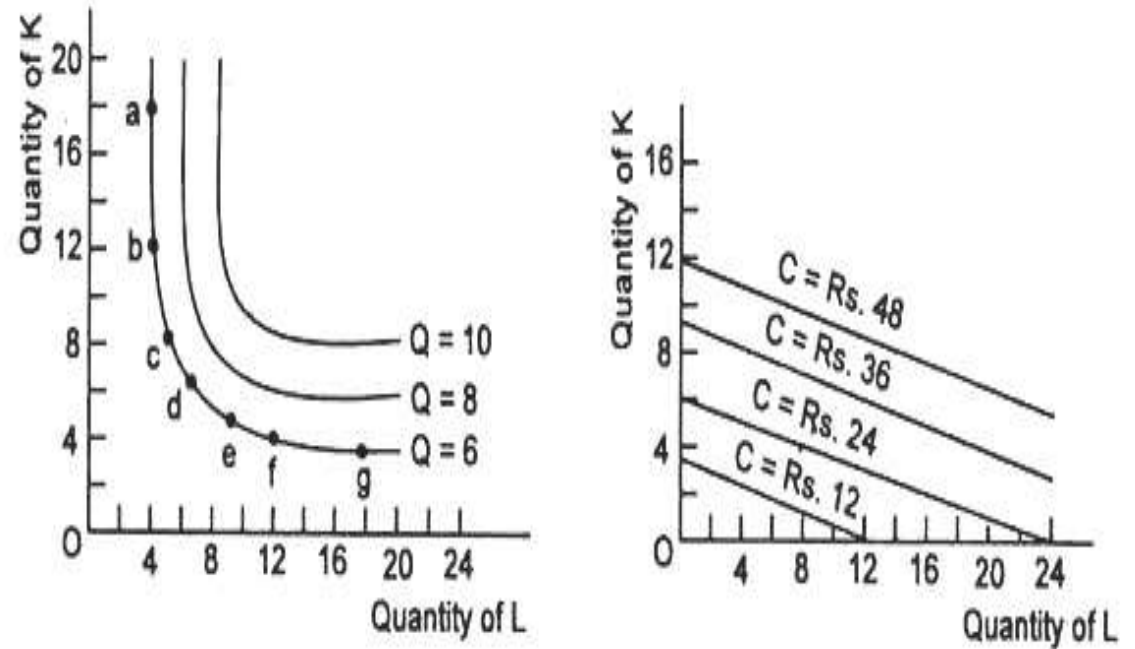

Fig. 5 & 6 : Isoquants and Isocost lines

Choice of Least Cost Factor combination

- In the theory of production, the profit maximisation firm is in equilibrium when, given the cost-price function, it maximises its profits on the basis of the least cost combination of factors.

- For this, it will choose that combination which minimizes its cost of production for a given output. This will be the optimal combination for it.

- This analysis is based on the following assumptions:

- 1. There are two factors, labour and capital.
- 2. All units of labour and capital are homogeneous.
- 3. The prices of units of labour (w) and that of capital (r) are given and constant.
- 4. The cost outlay is given.
- 5. The firm produces a single product.
- 6. The price of the product is given and constant.
- 7. The firm aims at profit maximisation.
- 8. There is perfect competition in the factor market.

- Explanation:

- Given these assumptions, the point of least-cost combination of factors for a given level of output is where the isoquant curve is tangent to an iso-cost line. In the Figure, the iso-cost line GH is tangent to the isoquant 200 at point M.

- The firm employs the combination of OC of capital and OL of labour to produce 200 units of output at point M with the given cost-outlay GH. At this point, the firm is minimising its cost for producing 200 units.

Fig. 17
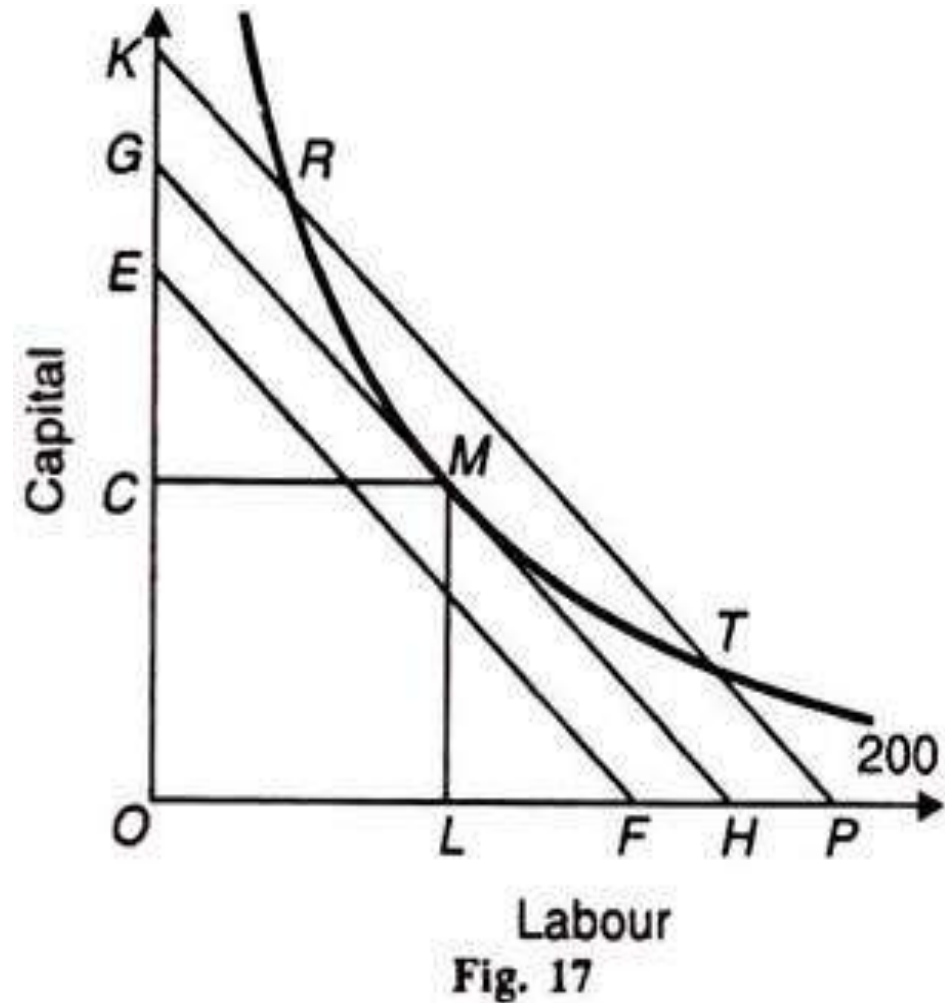
- Any other combination on the isoquant 200, such as R or T, is on the higher iso-cost line KP which shows higher cost of production. The iso-cost line EF shows lower cost but output 200 cannot be attained with it. Therefore, the firm will choose the minimum cost point M which is the least-cost factor combination for producing 200 units of output.

- M is thus the optimal combination for the firm. The point of tangency between the iso-cost line and the isoquant is an important first order condition but not a necessary condition for the producer's equilibrium.
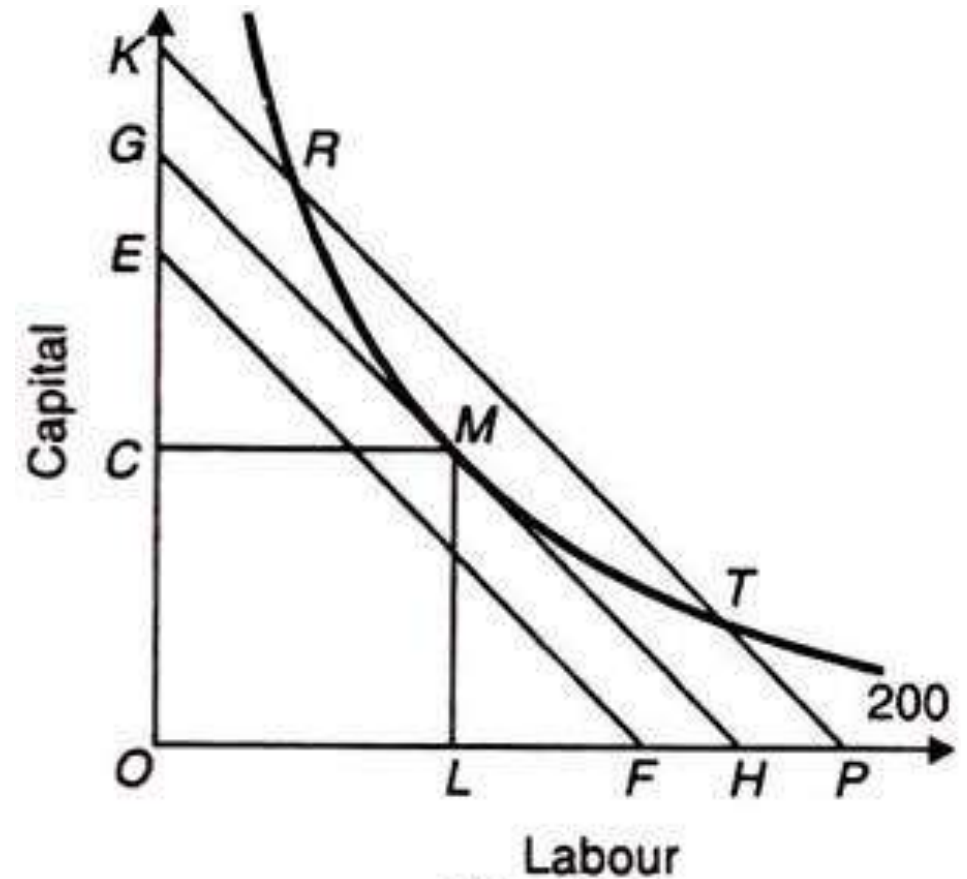
Fig. 17

Law of Returns to Scale

- The Law of returns to scale states that if all the four factors of production are increased in a definite proportion (fixed ratio) the resultant marginal productivity increases at a more than proportionate rate for some time, at an equi-proportionate later on and ultimatly at a less than proportionate rate.

- Law of returns to scale is also an integrated law consisting of three important laws called as the law of increasing, constant and diminishing marginal returns to scale.

- Changing all the factor proportions at a definite rate alters the size or the scales of plant and machinery. The resultant output however increases at an increasing, constant and diminishing rate.

Doses of factors of Production	Marginal Productivity
1	10
2	15
3	20
4	20
5	20
6	15
7	10
8	5

Law of increasing returns

Law of constant returns to scale

Law of diminishing returns to scale

- The additional doses of the inputs are employed and the marginal productivity increased at a more than proportionate rate till the 3rd dose indicating the operation of law of incresing returns to scale.

- From the 3rd dose to the 5th dose the marginal returns remained constant there by giving rise to the law of costant marginal returns to scale.

- From the 6th dose onwards marginal productivity started diminishing indicating the opertion of the law of diminishing marginal returns to scale.

Increasing returns to scale:
If the proportionate increase in the output is more than proportionate increase in the inputs it is said to be increasing returns to scale. It means when we double the inputs the output will be more than double.
Cause for increasing returns:
1. Specialization (or) Division of labour
2. Indivisible factors.
3. Dimensional economics
4. Volume discounts etc.,

Constant returns to scale:
If the proportionate increase in the output and proportionate increase in the inputs are same it is said to be constant returns to scale. It means when we double the inputs the output also will be double. There are no causes for constant returns. It is just an indicator for the ending of increasing returns and commencement of diminishing returns.

Diminishing returns to scale:
If the proportionate increase in the output is less than proportionate increase in the inputs it is said to be diminishing returns. It means when we double the inputs the output will be less than double.

Figure 1
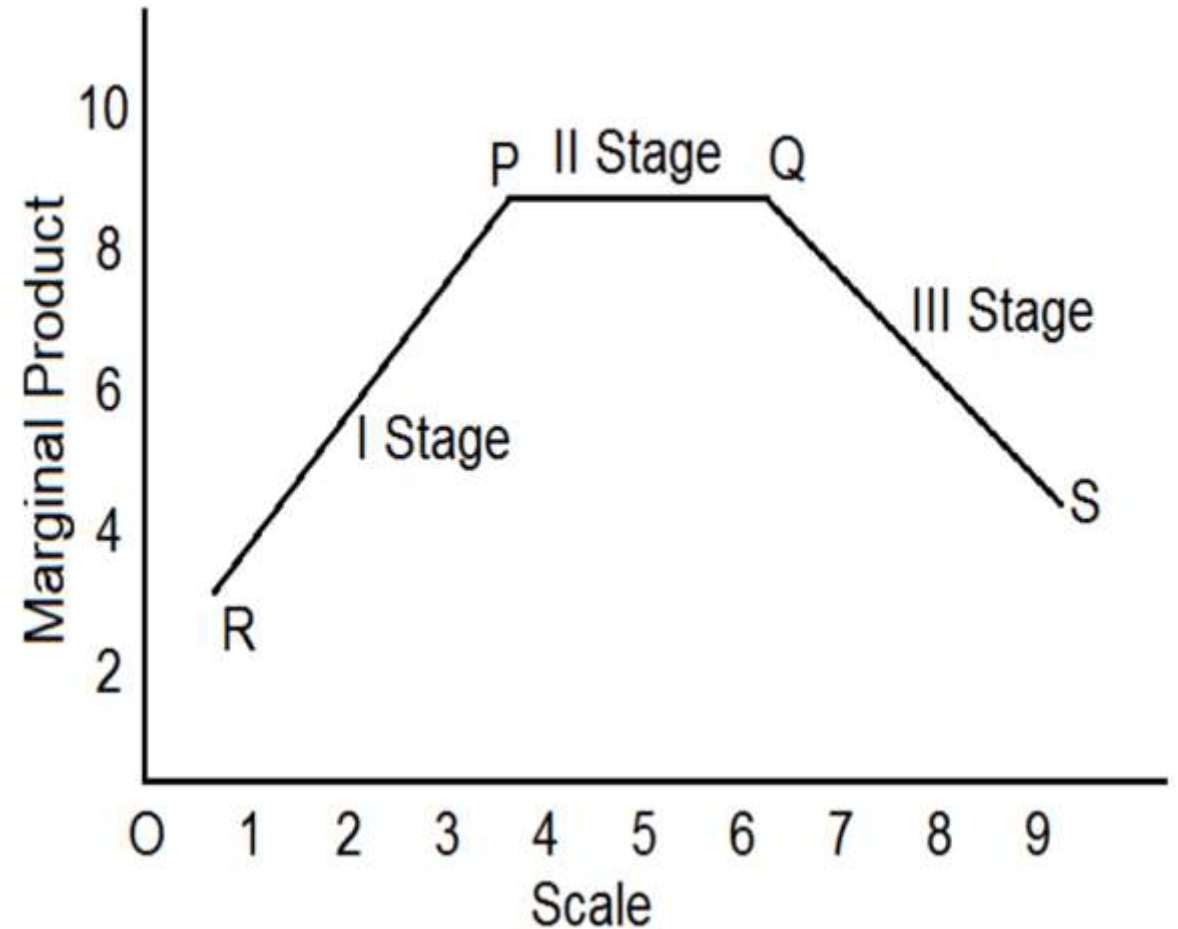
Economies of scale

- Economies of scale are cost advantages reaped by companies when production becomes efficient. Companies can achieve economies of scale by increasing production and lowering costs.

- Economies of scale are an important concept for any business in any industry and represent the cost-savings and competitive advantages larger businesses have over smaller ones.

- Economies of scale are cost advantages companies experience when production becomes efficient, as costs can be spread over a larger amount of goods.

- A business's size is related to whether it can achieve an economy of scale—larger companies will have more cost savings and higher production levels.

- Economies of scale can be both internal and external. Internal economies are caused by factors within a single company while external factors affect the entire industry.

Internal Economies of Scale:

- Internal economies of scale are associated with **the expansion of the scale of output of the firm;** they are derived indirectly as a result of expansion of the industry to which it belongs

- **Managerial Economies**: These economies arise on account of the scope of **employing better qualified and trained managers and other employees who are able to take quicker and more profitable decisions.** In addition, management experts are exploring new methods of improving the management of the firm and reducing its cost of operations.

- **Financial Economies:** It is a common knowledge that most firms have to depend upon borrowed funds. **The lenders, while deciding the rate of interest to be charged on their loans, give due importance to the 'creditworthiness' of the borrower.** And other things being equal, **bigger firms enjoy greater creditworthiness than the smaller one**. Accordingly, they are **able to borrow funds at lower interest rates.** For the same reason, they have also the option of raising additional sources through equity capital.

- **Technical Economies: With an increase in the scale of output, the choice of inputs and their varieties becomes wider for the firm**. It can go in for those machines and equipment etc. which have a higher marginal productivity as compared with their cost. In other words, it is possible to get a larger output per unit of cost incurred on them.

- **Bye-Products:** An increase in the scale of output also generates bigger flows of wastes. When the scale is small, the firm is not able to use these products for additional earnings. However, **when the generation of waste crosses a critical limit, it often becomes possible for the firm to produce certain bye-products or sell off the waste to other firms and thus add to its income**.

- **Better Utilization of Inputs: Various inputs, particularly machines and equipment are lumpy and indivisible. They also require time intervals for 'maintenance' and 'servicing' etc. Any one of them can go out of order and require repairs. If a machine goes out of order, or is otherwise not able to operate, then a firm with a small scale is not able to find its substitute and its production suffers.** For example, if a transport company has only one truck and that needs some repair, its employees are left unemployed for the time being, though the firm has to pay them all the while. In contrast, a firm with a bigger scale is able to adjust the availability of its machinery, equipment and employees etc. in such a manner that the 'downtime' of various inputs is adequately taken care of.

- **Economies of Inventories:** A bigger-size firm is in a better position to adjust its stocks of inputs and finished products etc. in such a manner that **the normal discrepancy between flows of production and sales are ironed out (solved).**

- **Marketing Economies:** A large firm also reaps the advantages of **buying and selling in bulk.** As a result, it is able to **procure its inputs at concessional prices**. Similarly, on account of **bulk selling, its average selling costs come down**. It can also have separate sales and marketing departments which can undertake the job of marketing its product in a professional manner. In addition, its sheer size imparts it better bargaining strength.

- **Advertising:** When a firm is not operating under conditions of perfect competition, it is obliged to undertake various **activities to promote its sales of which advertising** happens to be an integral part. It is found that a small firm is not able to afford advertising because it has to be repetitive to be successful. Moreover, **with an increase in the advertising budget, a firm is able to diversify its programme so as to cover more effective media and in an optimum proportion.** As a result, its per unit advertising expenses come down.

- **Risk Economies**: A large firm can diversify its product lines and thereby reduce the average risk faced by it since all product lines are not likely to generate losses simultaneously. The firm can compensate its losses from some lines with profits from the others. **A large firm has also better command over resources compared with a small firm.**

Internal Diseconomies

- The firm gets economies only upto a certain level of expansion. If the production base is expanded beyond a limit internal economies may give way to internal diseconomies. Some of these internal diseconomies are

- a. Stretching the factors of production beyond their optimal level of operation. When the firm expands beyond the controllable limits, organisational inefficiency sets in. Inefficient management and supervision may result in fall in production or rise in costs.

- b. As the number of employees increase leading to misunderstanding.

- c. In large departmentalization of work leads to lack of proper coordination and thereby results in duplication of work.

- d. Large industrial units often compain the problems created by la our uions puttingup unreasonable demands that impair productive efficiency and increases production costs.

External Economies of Scale:

- These economies are those which are reaped by a firm not on account of its own efforts and increase in its scale but on account of the expansion and growth of the industry to which it belongs and also on account of overall development of the economy and markets.

- External economies of scale occur outside of an individual company but within the same industry. Remember that in economics, economies of scale mean that the more units a business produces, the less it costs to produce each unit.

- External economies of scale describe similar conditions, only for an entire industry instead of a company. For example, if a city creates a better transportation network to service a particular industry, then all companies in that industry will benefit from the new transportation network, and experience decreased production costs.

- External economies of scale are business-enhancing factors that occur outside a company but within the same industry.

External Economies of Scale:

- **Economies of Information:** Availability of information is cheaper when we consider the industry as a whole. A firm requires **continuous information regarding the prices of inputs and its product,** as also likely changes in them on account of **shifts in government policies** and other developments. If the industry as a whole sets up facilities for providing information through various **means of communication,** it is much cheaper, than if it is done by the firm alone. As a result, when the authorities or the industry as a whole provides means of information, it becomes economical for the firm to use the same sets up.

- **Research and Development:** The results of research undertaken by the authorities or by the industry as a whole are economical for the firm to use. Also, it is generally commercially viable for a research organisation to undertake research on its own and sell the findings to individual firms on payment basis than for the firms to undertake the same individually.

- **Economies of Concentration:** When an industry is concentrated in a certain locality or region, its firms get incidental saving in costs in the form of cheaper and more reliable services. These services cover, for example, repairs, consultancy, banking, credit, insurance, financial advice, packing, transport, housing, communication, training, housing, health care, and so on. An individual firm is able to make use of these services at competitive and economical prices.

- **Economies of Specialization:** When a number of associated and interlinked industries get located in the neighborhood, they all provide support to each other and their costs come down. As a result, the individual firms also benefit from this development.

•External Diseconomies of Scale:

• a. There are several reasons for the prices of inputs to move up or their quality to deteriorate. For example, **the authorities may impose a tax on one or more inputs.** Or there may be a **wage revision in the industry or imposed by the authorities** on the economy as a whole.

• b. The expansion of an industry beyond limit may lead to diseconomies such as overcrowding of industrial centers, growth of slums and unhygenic living conditions.

• c. It is also possible that **prices of some imported inputs may go** up because of one or more reasons including for example, **customs duties imposed by the domestic government or by the exporting country or increase in cost of production abroad, etc.**

• d. It is possible that on account of **war, strikes, some natural calamity, or quantitative restrictions imposed by domestic country or a foreign country**, the availability of an essential input may become costlier or insufficient.

• e. There is another danger of the workers forming into a strong union and create labour problems.

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.

• **<u>COST CONCEPTS:</u>**

•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)

  - TC
- Average cost = ------
  - 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.

BREAKEVEN 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.

- 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)   P.V. ratio

Profit

- 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,

$$\frac{Contribution}{Sales} \times 100$$

- 7. **Break – Even- Point**:
- 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) =   Fixed Expenses

   Contribution per unit

- 2. Break Even point (In Rupees) = Fixed expenses

   -------------------- X Sales

   Contribution