Introduction to Production & cost Analysis

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Introduction :—

Production deals with activites that results in the creation which satisfy human wants that is making of goods and services for the satisfaction of human wants.

E.g: Man converts wood in to furniture.

→ In the form of wood, it does not satisfy our wants. But furniture satisfy our wants.

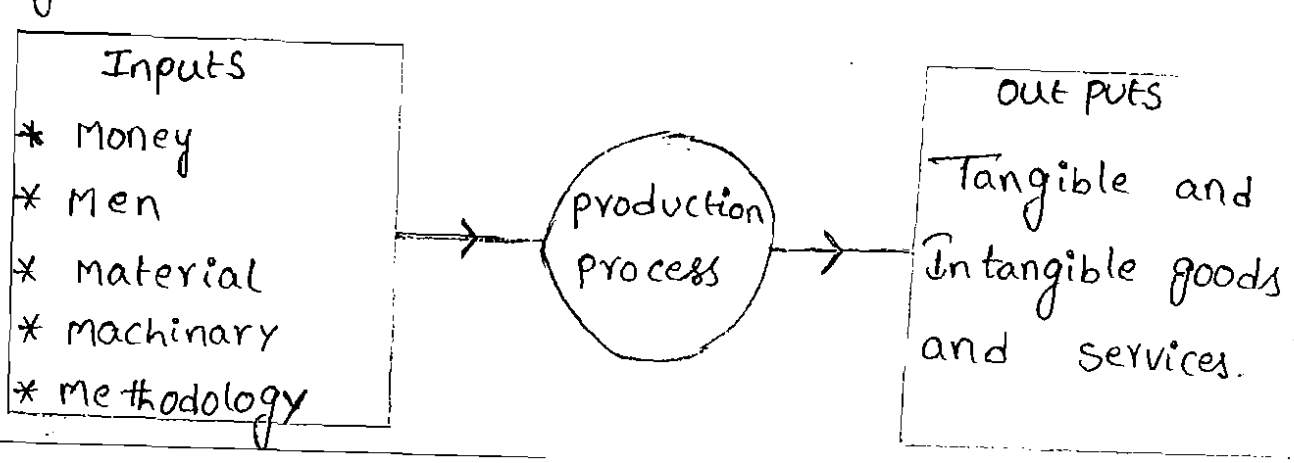
→ So, supply of goods and services comes out of producti

→ Production is making of goods for sales or rendering of paid services.

Production process :—

→ Production is the process of converting the inputs into the output.

→ This can be shown with the help of the following Diagram.



Production function :— [Input - output Relation ship]

"Production function is the physical relation ship between the firm's inputs and outputs."

→ Production function shows the maximum rates of output that can be obtained from different combinations of Inputs in a given time.

→ The production function can be mathematically expressed in the form of an equation.

$$Q = f(L_1, L_2, C, O, T)$$

where,

Q = The quantity of production

L_1 = Land

L_2 = Labour

C = capital

O = organisation

T = Technology.

Definitions :—

"The production function is the technical relation ship which reveals the maximum amount of output (o/p) capable of being produced by Each and Every set of Input (i/p)."

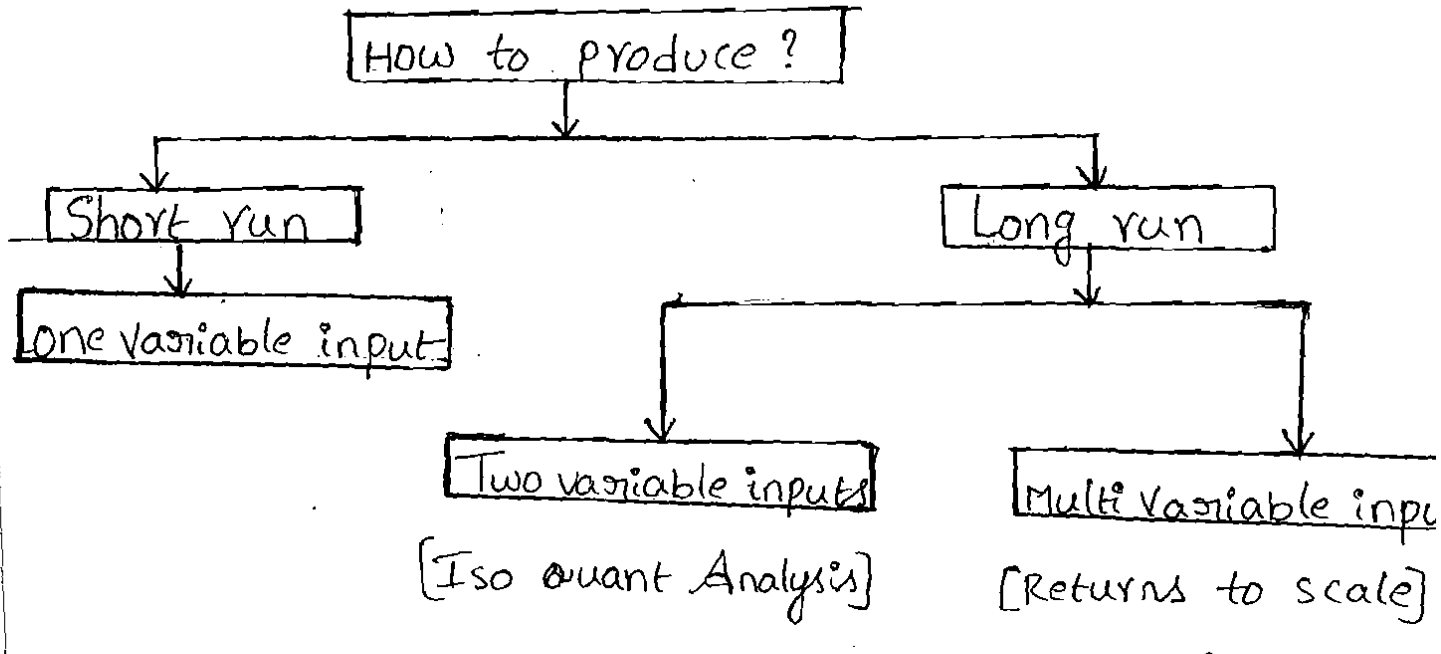
— Samuel Son

" The production function as that function which decide the maximum amount of output that can be Produced with a given set of inputs."

Laws of production:

The production function can be studied in 3 ways.

→ Production function with one variable input & law of retu
→ production function with two variable input & law of retur
→ Production function where input factors are multiple (or
Law of returns to scale.



Production function with one variable inputs & Laws of returns

→ "The short run production function is otherwise called Single variable production function."
→ This is also called "Law of Return", "Law of Variabl Proportions or "The law of Diminishing returns."

→ The law of production deals with the relation ship between additional inputs and additional outputs.

The law of returns states that when atleast one factor of production is varied and all other factors are fixed, the total output in the initial stages will increases at an increasing rate, and after reaching certain level of output, the total output will increase at declining rate.

If variable factor inputs are added furthur to the fixed factor input, the total output may decline.

This law is universal nature and it proved to be true in agriculture and Industry also.

The law states the relation ship between variable factors and output. How does output changes in that there are 3 stages.

This can be Explain with the help of the following table.

units of labour	Total product (TP)	Marginal product (MP)	Average product (AP)	Stages
1	5	5	5	
2	12	7	6	I stag
3	18	6	6	
4	20	2	5	II stag
5	20	0	4	
6	18	-2	3	III sta
7	14	-4	2	

1. Total Product :- It refers to the total amount of outpu

2. Average product :- It refers to the product of Each lab
If we divide the total product by
no. of labour.

$$A_p = \frac{\text{Total product}}{\text{No. of labour}}$$

3. Marginal product :- It refers to the additional produ
Obtained from the use of an additio
Labour

→ In the short run, It is assumed that capital is fixed factor input and labour is variable input. It is also assumed that technology is given and it is not going to change.

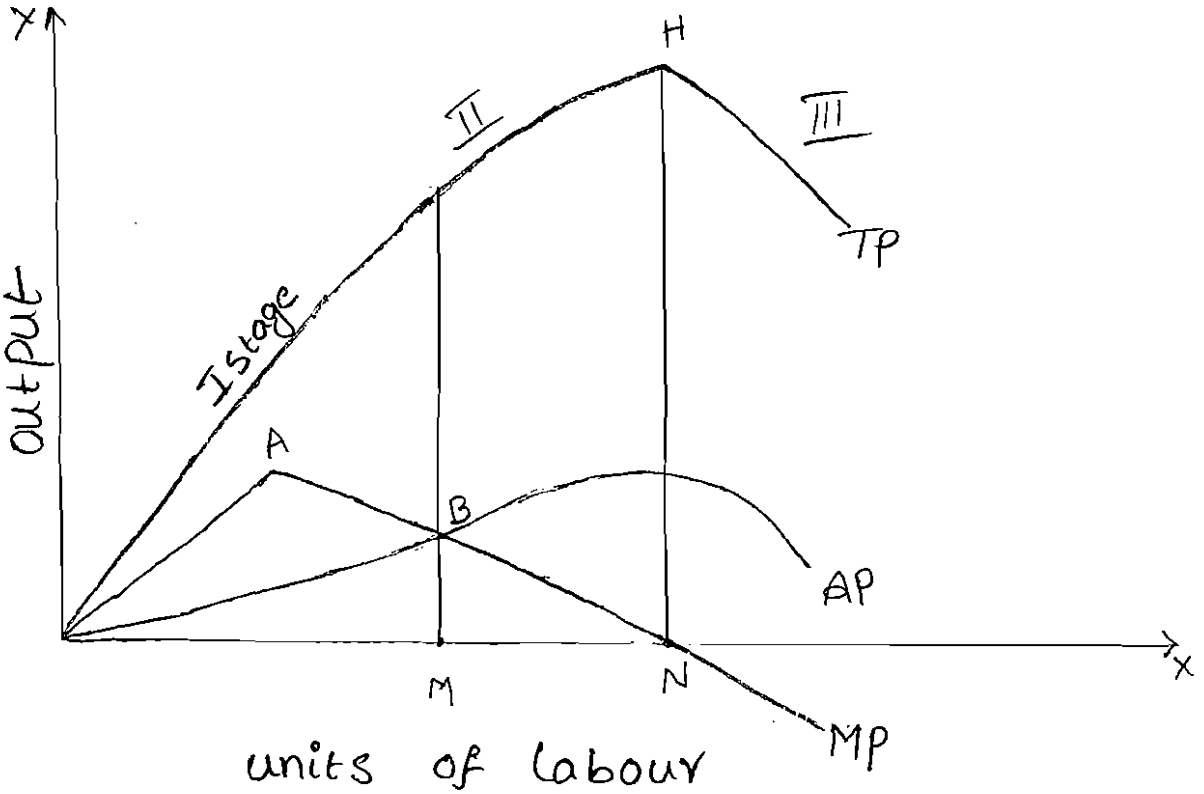
→ Under such circumstances, the firm starts production with a fixed amount of capital and uses more and more units of labour.

→ At the third labourer, the production is continue to increase and (MP) marginal product and Average product (Ap) are equal. So this is the first stage, i.e it is called Increasing return to variable factors.

→ In the second stage, the total output is increased, after that the Marginal product (Mp) and Average product are gradually decreased and the marginal product (M_p) is reached zero at the 5th labour. So, this is called IInd stage i.e "diminishing return to variable factor."

In the third stage, The marginal product (MP) is goes into Negative (minus). The total product (TP) is also started to decrease. So it is called "Negative returns to variable factors."

Diagramatic representation of law:—



In the above diagram the variable factors labour is shown on the x-axis and the output is shown in y-axis.

MP is the marginal product curve.

AP is the Average product curve

TP is the total product curve.

→ At first stage, the total product increases at an increasing rate, The total product curve (TP) goes sharply up to the point.

→ The point 'A', where the marginal product is maximum.

→ Afterward beyond point 'A' the total product increases at diminishing rate as the marginal produc falls.

→ At the point 'N' marginal product is zero, after th it goes into the Negative.

→ The 'B' point where the average product and marginal product are Equal

→ The stage in which total product, marginal product and Average product are increasing is denoted as Stage-I. It is the increasing return stage.

→ In the second stage, the total product continues to increase but at diminishing rate untill it matches the point 'H'.

→ In the Second stage, both marginal product and Average product are declining but are positive. At Point 'H' the marginal product is zero. It is called "diminishing returns"

→ Beyond 'H' the Total Product is falling and MP is negative. This is III^rd Stage and it is calling Negative returns Stage.

Production function with two variables Inputs & Law of returns

→ Let us consider a production Process that requires two inputs, capital (c) and labour (L) to produce a given output (Q).

→ In other words, the production function based on two inputs can be expressed as:

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

where 'C' refers to capital

'L' is labour

→ Normally, both capital and labour are required to Production. To some extent, these two inputs can be substituted for each other.

→ If only labour and capital are variable inputs then Selection of optimal factor combinations will depend upon;

1. Technical Possibilities of factor Substitution [ISOQUANTS]
2. Prices of factors of Production [ISO COSTS LINE

ISOQUANTS: —

→ 'Iso' means Equal, 'Quant' means Quantity.

→ An isoquant represents all those combinations of inputs, which are capable of Producing the same level of output.

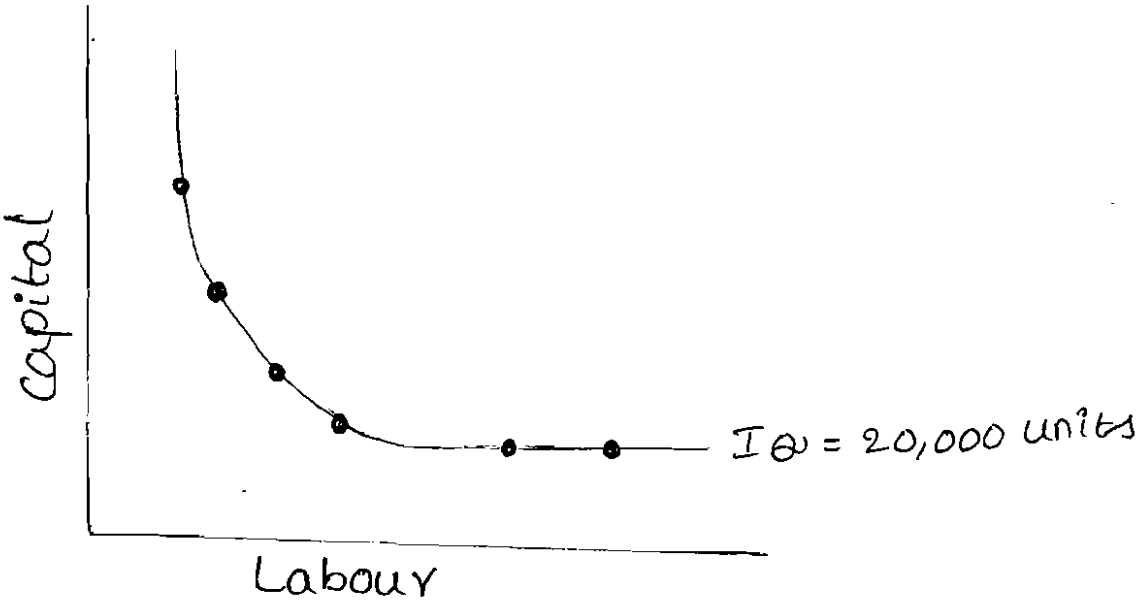
→ Iso quants are also called "Equal product" (or) "Isoproduct" (or) "Iso-Product curves."

→ Since an Equal-Product curve represents all those Combination of inputs which yield an equal quantity of output, the producer is in differentee between them.

→ Therefore, another name for an Isoquant is "Product indifference (or-difference) curve." This concept can be Easily understood with the help of the following shedule.

Combinations	capital [Rs. in Lakh]	No. of Labourer
A	1	20
B	2	15
C	3	11
D	4	8
E	5	6
F	6	5

The above table shows the different combinations of input factors to yield an input of 20,000 units of output. As the investment goes up, the number of Labourers can be reduced. The combination of A shows 1 unit of capital and 20 units of labour to Produce say, 20,000 units of output. All the above combinations of inputs can be plotted on a graph, the locus of all the Possible combinations of inputs shows up on Isoquant as shown in the below figure.



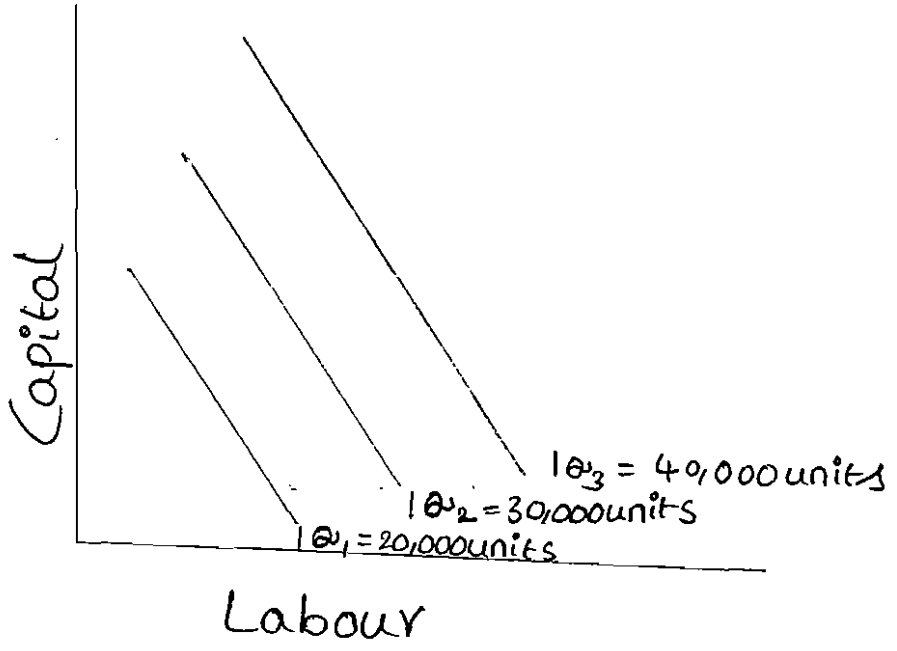
Isoquant yielding 20,000 units of Production.

Features of an Isoquant :—

1. Downward sloping :— Iso quants are downward sloping curves because, if one input increases, the other one reduces

→ There is no question of increases in both the inputs to yield a given output.

→ A degree of substitution is assumed between the factors of Production



Isoquants where Input-factors are perfect substitute

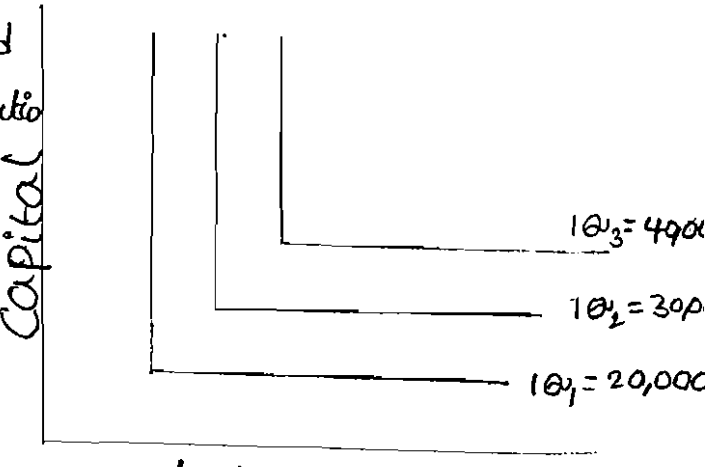
2. convex to origin :—

→ Isoquants are convex to the origin. It is because the input factors are not perfect substitutes.

→ one input factor can be substituted by other input factor in a "diminishing marginal rate."

→ If the input factors were perfect substitutes, the Iso-quant would be a falling straight line.

→ when the inputs are used in fixed proportion, and substitution of one input for the other cannot take place, the isoquant will be L shaped.

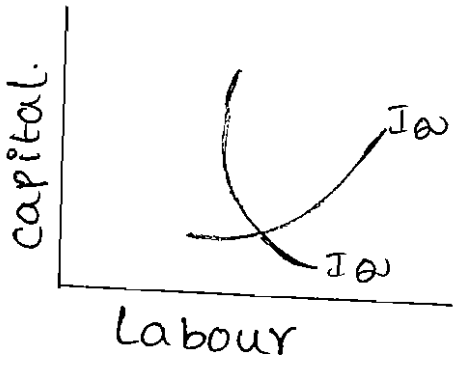


Isoquants, where Input factors are not perfect substitutes.

3. Do not intersect :—

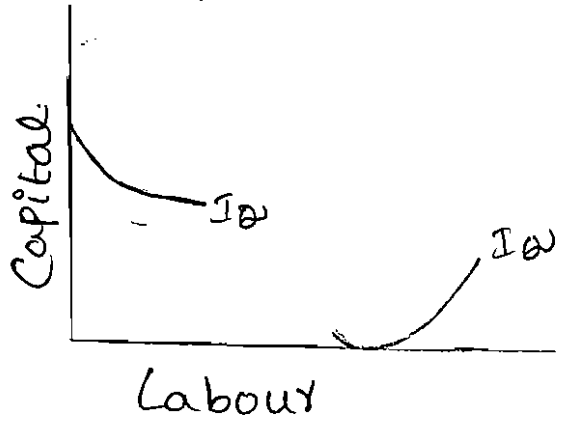
→ Two isoproducts do not intersect with Each other. It is because, Each of these denote a particular level of output.

→ If the manufacturer wants to operate at a higher level of output, he has to switch over to another isoquant with a higher level of output, and vice versa.



4, Do not touch axes :—

The isoquant touches neither x-axis nor y-axis, as both inputs are required to produce a given product.

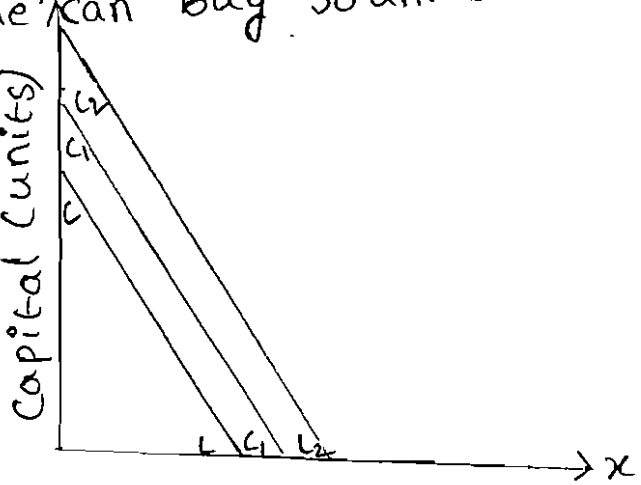


Isocosts :—

Isocosts refers to that cost curve that represents the Combination of inputs that will cost the producer the same amount of money. In other words, each Isocost denotes a Particular level of total cost for a given level of Production.

→ If the level of Production changes, the total cost changes and thus the Isocost curve moves upwords and vice versa.

E.g :— Let us assume that a producer having ₹.500 with him the price of units of labour is, say ₹.10 then he can buy 50 units of labour.



Similarly, when the Price of a unit of capital is ₹.5, he can buy 100 units of capital.

one Iso-cost showing the quantities of labour and Capital that can be purchased for ₹.500, another Iso cost curve showing the quantities of labour & capital which can be purchased for an expenditure of 1000 and so on

→ Given the Prices of capital as ₹.5 per unit and labour as ₹.10 Per unit

→ If the Producer spends ₹.500, C, L will be the Iso-cost curve.

→ If producer spends ₹.1000, C, L will be the Iso-cost cur

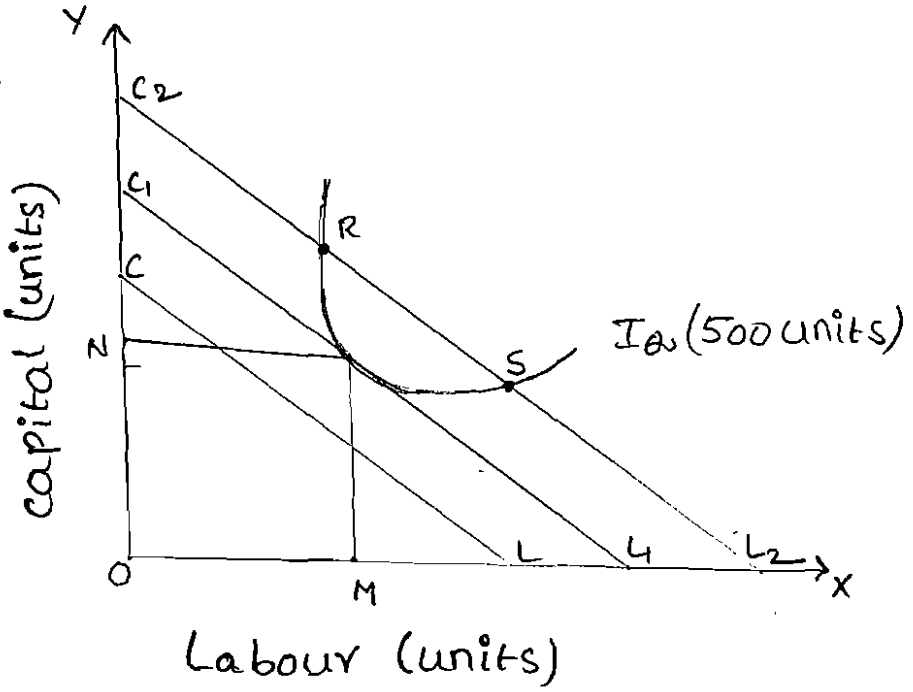
→ If Producer spends ₹.2000 C_2 L_2 will be the Iso-cost cu

Least cost combination of inputs:—

→ The manufacturer has to produce at lower cost to attain higher Profits.

→ The Iso-cost and Iso-quants can be used to determi the input usage that minimises the cost of producti

→ where the slope of Isoquant is equal to that of Iso-cost, there lies the lowest Point of cost of Production.



COBB-DOUGLAS Production functions:—

→ This is also called stastical Production function.

→ The most well known production function is the cobb Douglas Production function.

→ The American ex. Senator and Economist paul-H. Douglass and the mathematician C.W Cobb made a Statistical study in the 1920s to find out the actu Production in the whole of the American manufacturing Industry.

→ The output this function is the American manufacturing output, the inputs are capital and labour.

Cobb-Douglas Production function takes the form. $Q = ~~ALCb~~ \; bL^a C^{1-a}$

where Q = total output

L = Index of Employment of labour in manufacturing

C = Index of Employment of fixed capital i manufacturing

b = Possitive constant

The Exponents 'a and 1-a' are the elasticities of Production that is, "a" and '1-a" measure the percenta response of output to percentage change in labour and capital respectively.

→ The function estimated for the USA by Cobb-Douglas is $b = 1.01$ $L = 0.75$ $C = 0.25$ $R^2 = 0.9409$

→ The production function shows that one percent chan in labour input, capital remaining the same is associated with a 0.75 percentage change in output.

→ Similarly one percentage change in capital, labou remaing constant is associated with a 0.25 percent change in output.

→ The coefficient of determination (R^2) means that 94 of variations on the dependant variable (Q) were accounted for by the variations in the dependant variables (L, C)

→ It indicates constant returns to scale, which means that there are no Economics or diseconomics of large Production.

→ on an average, large and small scale plants are considered equally Profitable in the US manufacturing industry.

→ on the assumption that the average and marginal produ -ion cost were constant.

Production function where Input factors are multiple (or) Law of returns to Scale:

Production function with multiple variables are als known as the "Law of returns to scale."

when we increase all factors of production in th some proportion, the returns we get are called return t Scale.

If we go on increasing the factors of production wege three types of return to scale.

1. Increasing return to scale
2. constant return to scale
3. Decreasing return to scale.

1. Increasing return to scale:—

Increasing return to scale prevail if the Proportionate increases in the output is more than the Proportionate increases in the input.

2. constant return to scale:—

The proportionate increases inputs is equal to the Proportionate increases in output. we will not get increasing returns continuously. If we go on increasi the size of the firm after certain stage. we get onl constant returns to scale. The change in output an inputs is the same in this stage. when we doub

the inputs then the production will also be doubled

3. Diminishing return to scale:—

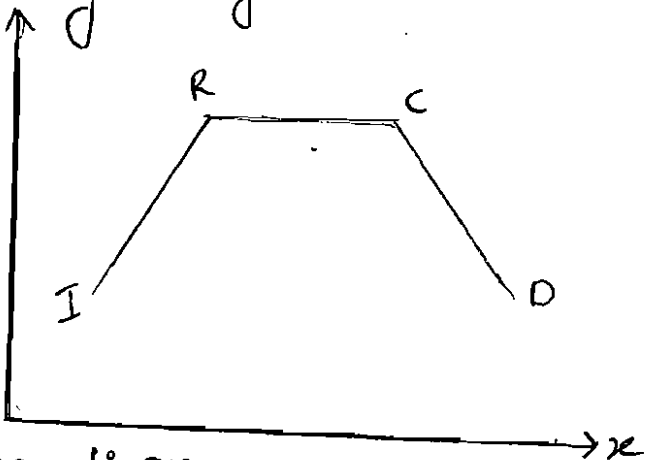
The diminishing returns prevail if the proportionate increase in the output is less than the proportionate increases in the input.

→ If we go on increasing the inputs after a certain stage we will get diminishing return to scale.

→ The following are the main causes for diminishing retu such as;

a. wrong combination.
b. Scarcity of factors.
c. Imperfect substitution of Inputs.
d. difficult to supervise & control.

→ The following diagram shows the 3 stages of return to scale.



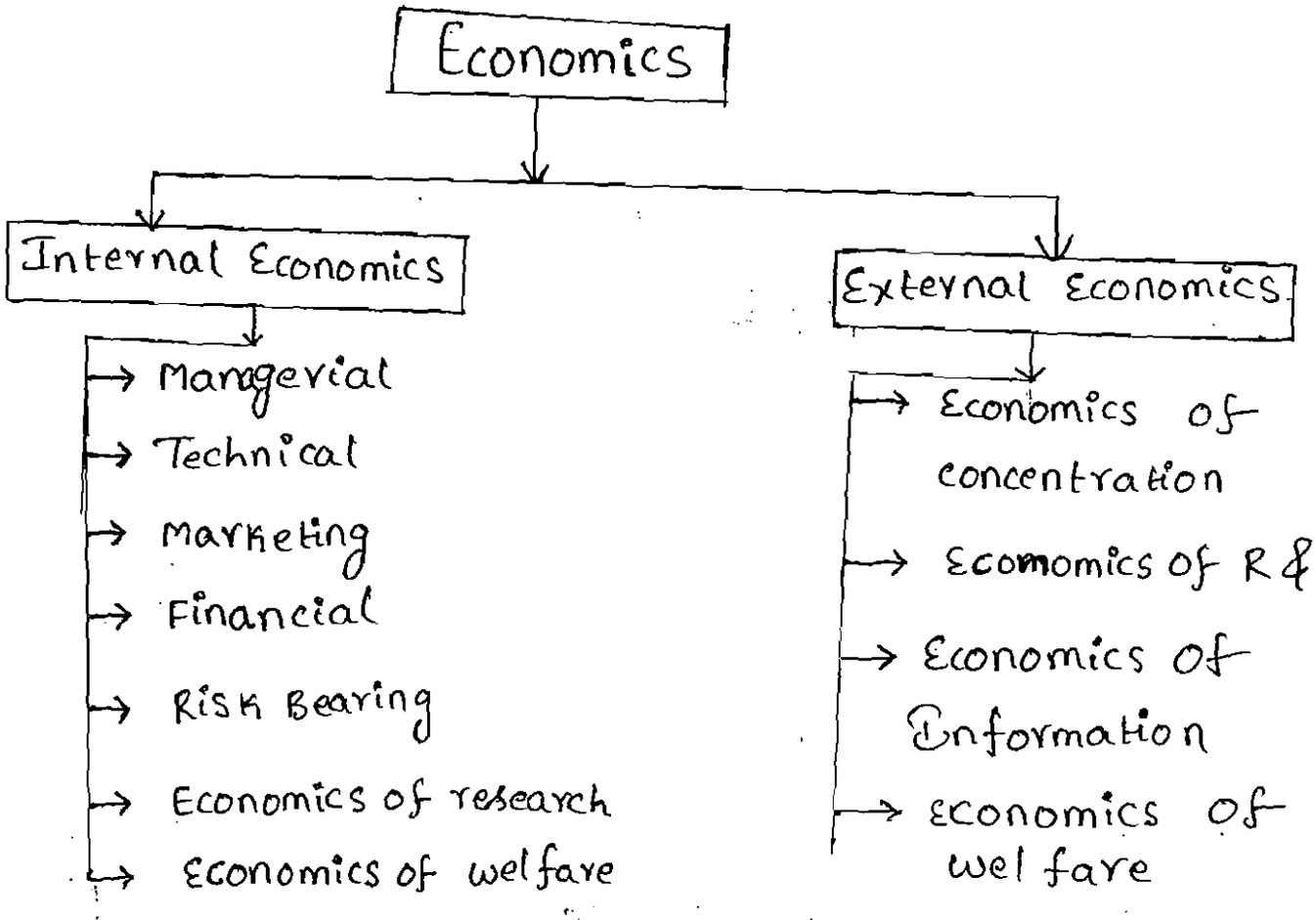
The given diagram shows these three stages of returns to scale. IRCD is the return to scale curve.

where, → I to R is the increasing returns to scale
→ R to c is the constant returns to scale
→ c to d is the diminishing returns to scale

Economics of Scale :—

Production may be carried on a small scale o on a large firm. when a firm Expands its size of Production by increasing all the factors, it Secures certain advantages know as Economics of Production.

These economics of large scale Production have been classified by marshall into internal Economics and External Economics.



Internal Economics :—

Internal Economics refer to the economics whi arise because of the development of a Particular firm. These Economics must be related to that Particular firm only.

The internal Economics can be again classified into follo

1. Managerial Economics :—

As the firm Expands, the firm needs qualified managerial personel to handle Each of its functions; marketing, finance, Production, human resource and othe
→ Functional specialisation ensures minimum wastage and lower the cost of Production in the long-run.

2. Technical Economics:—

Technical Economics arise to a firm from the use of better machines and superior techniques of productio
→ As a result, Production increases and per unit of cos of Production falls.
→ A large firm which employs costly and superior plan and machinary enjoys a technical superiority over a small firm.

3. Marketing Economics:—

As the firm grows larger & larger, it can affo to maintain a full, fledged marketing department independently to handle the issues, related to design of customer surveys advertising material, Promotion campaign, handling of sales & marketing staff, renting of hoardings, launching a new Product and so on.

4. Financial Economics :—

→ There could be cheaper credit facilities form th financial institutions to meet the capital Expenditur or working capital requirements.

→ A larger firm has assets to give security to the financial institution which can consider reducing the rate of interest on the loans.

5. Risk - Bearing Economics :—

→ As there is growth in the size of the firm, there i increase in the risk also.

→ Sharing the risk with the insurence companies is the first priority for any firm. The firm can insure its machinary and Other against the hazards of fire, th and other risks.

→ when large firm produces many commodities and Services then it is sharing the losses of one commodit be half of the another.

6. Economics of Research :—

A large firm passes larger resources and ca Establish its own research laboratory and Employ trained research workers. The firm may even invest new production line techniques for increasing its output and reducing cost.

7. Economics of welfare :—

A large firm can provide better working conditio in and out side the factory, facilities like;

→ subsidised canteens,

→ creches for the infants,

→ recreation rooms,

→ cheap houses,

→ Educational and

→ medical facilities tend to increase the producti Efficiency of workers which helps in raising Production and reducing cost.

External Economics :—

External Economics refer to all the firms in the industry because of growth of the industry a a whole (or) because of growth of ancillary indust Hence, External Economics benefit all firms with in the industry as the size of the industry expa -s.

Business firm Enjoys a number of External Economics, which are discussed below.

1. Economics of concentration :—

When an industry is concentrated in an partic area, all the member firms reap some common Economics like

→ Skilled labour,

→ improved means of transport & communications,

→ Banking & financial services

→ Supply of Power and

→ Benefits from subsidiaries.

All these facilities tend to lower the unit cost of production of all the firm in the industry.

2. Economics 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 informati headed by the firms. It will benefit all firms in an industry and this helps in raising the productiv Efficiency of the firms and reduction in their cos

3, Economics of welfare:—

An industry is in better position to provide welfare facilities to the workers. It may get land at concesional rates and procure special facilities fro from the local bodies for setting up housing colonie for the workers. It may be also establish public health care units, Educational institutions both general and technical so that a continuous supp of skilled labour is available to the industry.

This will help the efficiency of the workers.

4. Economics of Disintegration :—

The firm in an industry may also reap the Economics of specilisation. when an industry Expands it becomes Possible to split up some of the processe which are taken over by specialist firms.

E.g :— In the cotton texttile industry, some firms may specialise in manufacturing thread, others in Printing, still others in dyeing, some in long cloth, some in dhoties, some in shirting etc. as a result. The efficiency of the firms specialising in differe fields increases and the unit cost of production falls.

Thus internal Economics depend upon the size of the firm.

and External Economics depend upon the size of the industry.

Dis Economics of Scale :—

Internal and External diseconomics are the limits large scaleproduction. It is possible that expansion of a firms output may lead to rise in costs and thus results dis economics insted of economics. when a firm Expands beyond proper limits, it is beyond the capacity of manager to manage it Efficiently This is an Example of an internal diseconomy

In the same manner expansion of an industry may be results in diseconomics which may be called external economics.

→ Employment of additional factors of production becomes less efficient and they are obtained at higher cost.

→ The major diseconomics of large scale production.

* financial diseconomics
* Managerial diseconomics
* Marketing diseconomics
* Technical diseconomics
* Diseconomics of risk-bearing.

———— ★ ————

COST ANALYSIS

Introduction :-

→ cost refers to expenditure incurred to produce particular goods and services is called as cost

→ Cost of production refers to "Amount of expenditure incurred by producer in making of goods and services is called cost of production.

→ Cost of production normally includes the cost of raw materials, labour and other expenses.

→ This cost is also known as total cost (TC)

→ This is compared with the total revenue (TR) realised on the sale of the products manufactured

→ The difference between the total revenues and total cost is termed as profit.

$$TR - TC = \text{profit}$$

Cost Concepts :-

Actual cost and opportunity cost :-

"Actual cost" means the actual expenditure inccured for acquiring or producing a good or service. These costs are the costs that are generally recorded in books of account.

Actual wages paid, cost of material purchased, interest paid, ----

→ These costs are also known as "Absolute costs" (or) "Outlay costs".

→ Opportunity costs can be distinguished from Outlay costs based on the nature of sacrifice.

→ Opportunity costs refer to "earnings/profits that are foregone from alternative ventures by using given limited facilities for particular people.

They represent only the Sacrified alternatives. So, they are never recorded in the books of account. However there costs must be considered for decision making.

→ Opportunity costs refer to the "costs of the next best alternative foregone".

→ We have scarce resources and all these have alternative uses where there is an alternative, there is an opportunity to reinvest the resources.

→ In other words, if there are no alternatives, there are no opportunity costs.

→ In other words, the benefits from the present option should be more than the benefits of the next best alternative.

→ Opportunity cost is said to exist when the resources are scarce and there are alternative uses for these resources.

→ Capital is invested in plant and machinary. It cannot be now invested in share (or) debenture. The loss of interest and divided that would be earned is the opportunity cost.

Explicit cost and Implicit cost :-

The cost of using resources in production involves both — Explicit costs Out of pocket costs

— Implicit costs (Non cash costs (or) Imputed cost (or) Book cost)

* Explicit cost involves payment of cash. The rent for the landlord, wages for the labourer, interest paid on the funds borrowed, taxes & duties paid to the Government and Soon are the explicit costs. These are the actual costs that appear in

the books of accounts.

Implicit costs are also called imputed costs. Implicit cost donot involve payment of cash as they are not actually incurred. Hence, does not appears in the book of accounts.

Examples of implicit costs are interest on own capita Salary of the manager, rent of own premises etc.

→ Wages and Salaries paid to the employees are "out of pocket costs" while Salary of the owner, if not paid is a "book cost".

3. Out of pocket cost and Book cost :-

Out of pocket cost is also known as implicit cost that involves current cash payment wages, rent, interest etc are examples.

Book cost also called implicit costs donot requi current cash payments such as unpaid Salary of the owner or manager, depreciation, unpaid interest etc.

4. Historical cost and Replacement cost :-

Historical cost is the original cost of an asset. Historical cost valuation shows the cost of an asset. paid originally when the asset was acquired in the past.

Replacement cost is the price that would have to be paid currently to replace the same asset.

The price of a machine at that time of purchase was ₹. 20,000 and the present price of the machine is ₹. 25,000. The original ₹ 20,000 is the historical cost ₹ 25,000 is the replacemen cost.

5. Fixed and Variable costs :-

Fixed cost :- Fixed costs are those costs that are fixed in the short-run. whether production is taken up & not, we have to incur certain expenses such as;

→ rent for factory and office buildings.
→ Insurance
→ Telephone
→ electricity and so on.

Even if the production is stopped temporarily for a short period, we continue to spend on these fixed costs In other words, total fixed costs are fixed (or Consta up to some extent of output. Fixed cost per unit changes with volume of production. The more you produce, the less is the fixed cost per unit and Vice Vers

Variable cost :-

Variable costs are those costs that vary with the volume of production. An increase in total output result in an increase in total variable cost and decrease in total output results in a decrease in total Variable cost. It includes cost of raw materials, wages paid to the labour and so on.

These costs are incured when there is production. If the production is temporarily suspended, there will not be any variable costs.

6. Long run Vs Short run costs :-

Long run is defined as a period of adequate length during which a company may alter all factors of production with high degree of flexibili The short run is defined as a period relatively shorter when atleast some of the factors of production are fixed. When atleast some of the

factors of production are fixed.

→ Long run cost cover the cost of changes in the size and kind of plant.

→ Short run cost cover the costs associated with the variation in the utilisation of fixed plant or other facilities.

→ In the long run there is perfect flexibility in the size of plant, labour force, executive talent and so on.

→ Such a degree of flexibility is lacking in short run.

7. Average cost, Total cost and Marginal cost :-

Total cost :- Total cost is the total cash payment made for input needed for production. It may be explicit or implicit so it is the sum of total of fixed and variable cost.

Average Cost :- Average cost is the total cost per unit of output is obtained by dividing the total cost (TC) by the total quantity produced. (Q)

$$AC = \frac{TC}{Q}$$

Marginal Cost :- Marginal cost is the additional cost incurred to produce an additional unit of output. In other words it is cost marginal unit produced (ATC) or (change in TC)

BREAK EVEN :-

Introduction :-

Profit maximisation is one of the main purpose of any business. The profit of any firm depends on 3 elements namely.

a. Cost of production.
b. Selling price
c. Volume of Sales.

These 3 factors are interdependent. Cost determin the Selling price. The Selling price affects the Volume of Sales. The Volume of Sales influence the Volume of production. This Volume of production inturn affects the cost. Thus an analysis of relationship between Cost, Volume and profits helps the mgt for profit planning.

The Study of "cost-volume-profit analysis" is popular known as "Break-Even analysis". It is an extension of the marginal costing principles.

Break even analysis is used in two senses namely narrow and broader sense.

In a narrow Sense:- It means finding break even point i.e, no profit (or) no loss point. At break even point total Sales are equal to total costs. Thus there is neither profit nor loss.

In a broader Sense:- Break Even analysis refers to the relationship between costs, volume and profit at different levels of sales.

According to Matz, Curry and Front,

A Break Even Analysis indicates the level at which cost and revenue are in equilibrium.

Break-Even point :-

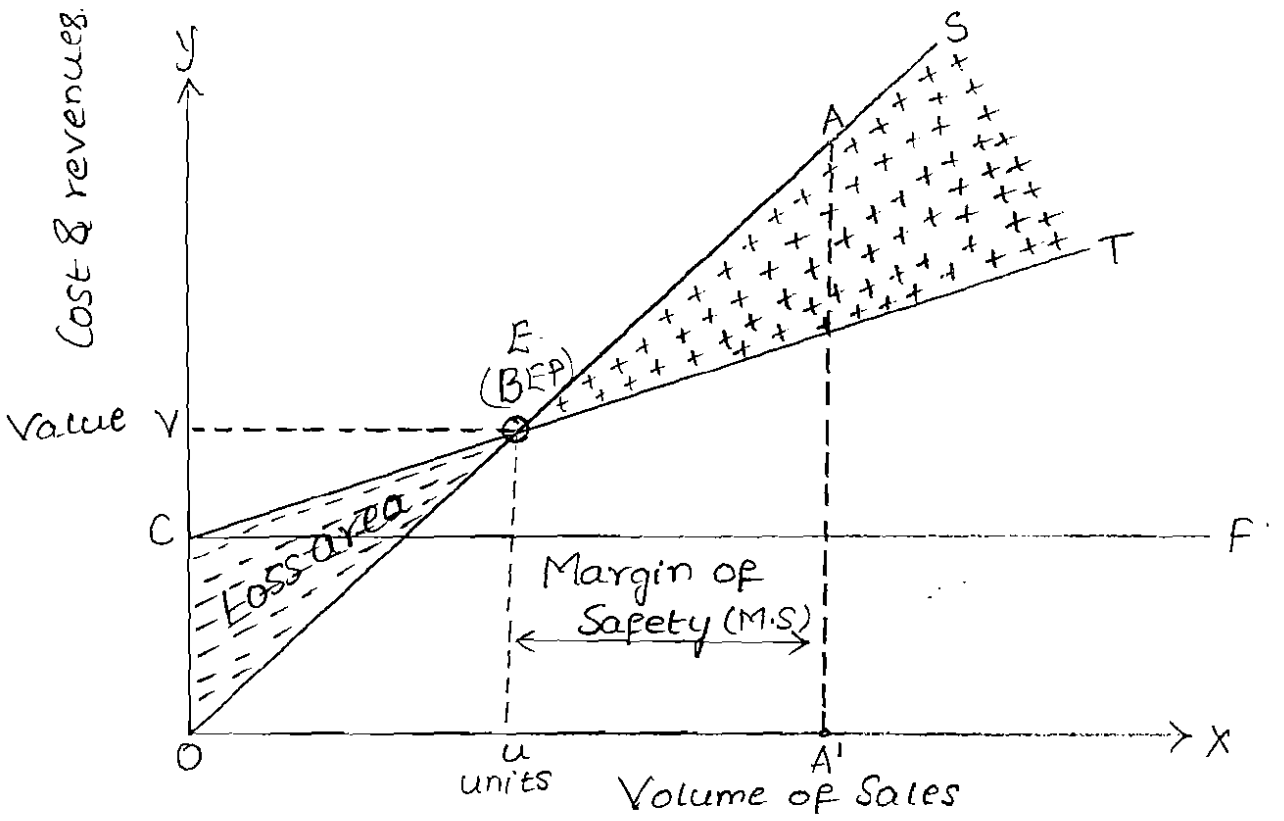
A break even point is the point on level of activity where total cost will be exactly equal to the total Sales. Any activity beyond this level will be a profitable one and below this will be losses.

Break-Even chart :-

A Break-Even chart portrays a pictorial View of the relationship between costs, volumes and profit. This chart Shows the break-Even point and also the estimated profit or loss at various levels of output. The Break Even point as indicated in the chart is the point at which the total cost line and total Sales line interest.

Steps to construct Break-Even graph :-

1. Let the x-axis represent the Volume and the y-axis represents the costs and revenues in rupees.
2. Draw the fixed cost (F.c) line parallel to x-axis from the point in y-axis which represents the costs and revenues in rupees.
3. Total cost is the total of fixed cost and Variable cost. Therefore, total cost line starts from the fixed cost line and moves upwards proportiona to output.



CF	Fixed cost (FC)	MOS	Margin of Safety
CT	Total cost (TC)	BEU	Break even units
OS	Total Sales (TS)	BV	Break even Value
AA'	Actual Sales or Production	ISBI	Angle of incidence
B	Break even point		

4. The total Sales line will start from the origin and moves upwards. At a particular point, total cost line intersects the total Sales line, that is the Break Even point. At this level of activity total cost equals total Sales.
Any activity beyond this level will be profitable and below this it will be a loss.

5. Angle of incidence is the angle between total cost line and total sales line at the break even point. It will give the profitability position of

the concern.

Greater the angle, greater the profitability and lesser the impact of market conditions.

6. Margin of Safety is the distance between actual Sales and break even Sales on the break even chart. Greater the margin, Safer the firm from business. losses, market variations and production differences will not adversely affect the profitability of the firm.

SIGNIFICANCE OF BEA :-

Break even analysis is a valuable tool.

* To ascertain the profit on a particular level of Sales Volume.
* To calculate Sales required to earn a particular desired level of profit.
* To compare product lines, Sales area, methods of Sale for individual company.
* To compare the efficiency of the different firms.
* To decide whether to add a particular product to existing product line.
* To decide to 'make or buy' a given component or Spare part.
* To decide what promotion mix will yeild optimum Sales.
* To assess the impact of changes in fixed cost, Variable cost or Selling price on BEP and profits during a given period.

④ Calculation of Sales to earn a given profit (in unit) = $\frac{\text{Fc + p}}{\text{C per unit}}$

Calculation of Sales to earn a given profit (in Rs) = $\frac{\text{F+p}}{\text{PV ratio}}$

⑤ Sales at which 2 co.s earn the same amount of profit = $\frac{\text{diff. in Fc}}{\text{diff. in pv ratio}}$ (or) in units = $\frac{\text{diff. in Fc}}{\text{C per unit}}$

⑥ Mos = Actual Sales − BEp Sales (or)

Mos % = $\frac{\text{Actual Sales} - \text{BEP}}{\text{Actual Sales (AS)}} \times 100$ (or)

= $\frac{\text{Mos}}{\text{Total AS}} \times 100$

Mos = $\frac{\text{Profit}}{\text{pv ratio}}$

Profit = mos × pv ratio (or) AS × Mos ratio × pv ratio.

⑦ BE Sales in percentage = $\frac{\text{BEP}}{\text{Total Sales}} \times 100$ (&) 100 − Moss in %.

⑧ profit = Sales − Total cost (&)

= Sales − V.C − F.C (&)

= C − F.C (&)

= Mos in Rs × pv ratio

⑨ F.C = Sales − Variable cost − profit (or)

= C − profit (or)

= Total cost − VC (&)

= Sales at BEp in Rs × pv ratio.

⑩ Overall BEP (of all products) = $\frac{\text{Total FC of all products}}{\text{overall pv Ratio}}$

Actual Sales = Mos + BEp Sales.

Formulae and Abbrevations

① Contribution = Sales − Variable cost

$C = F.C + \text{profit}$ (or) $Fc - \text{loss}$

Thus $S - V = F + p$ (or) $S - V = F - L$

Contribution = Sales in Rs × pv ratio (or)

(Sales at BEP in Rs × pv ratio) + profit

$C = (\text{Sales at BEp in units} \times \underset{\text{per unit}}{\text{Contribution}}) + \text{Profit}$

$C = (\text{Mos in Rs} \times P/V \text{ ratio}) + Fc$

$C = (\underset{\text{per unit}}{\text{Mos in units} \times \text{contribution}}) + Fc$

$C = \dfrac{\text{profit}}{\text{Mos in \%}}$

② P/V Ratio (or) c/s Ratio (or) Marginal income ratio :-

$P/V \text{ Ratio} = \dfrac{C}{S} \times 100 = \dfrac{S-V}{S} \times 100$

$p/v \text{ Ratio in \%} = \dfrac{C}{S} \times 100$

$= \dfrac{\text{change in profit}}{\text{change in Sales}}$ (or) $\dfrac{\text{change in Contribution}}{\text{change in Sales}}$.

$= \dfrac{Fc}{\text{BEP in RS}} \times 100$ (or) $\dfrac{\text{Profit}}{\text{Mos in Rs}} \times 100$

③ BEp :-

$\text{BEp in units} = \dfrac{\text{Total Fc}}{\text{Contribution per unit}} = \dfrac{\text{Total Fc}}{\underset{\text{per unit}}{\text{Sales}} - \text{Vc per unit}}$

$\text{BEp in Rs} = \dfrac{Fc}{\text{Pv ratio}} = \dfrac{Fc}{C} \times Sp$

BEp = Actual Sales − Mos