Unit-2

Theories of production and cost analysis

1) Production: -Production is a process by which the inputs (factors) are converted into outputs (economics goods). (Or) production process of transforming factors such as land, labor and capital into goods and services.

Production means creation of goods and services for the human consumption.

Factors of production:-

Land: In economics the term land is used to describe all these free gifts of nature Eg: Agriculture land, building, mines, fisheries etc., Land is the means of supporting vegetable, animal and human life. It is the source of all matters. David Ricardo and T.R Malthus built their theories on what they regarded as the unique feature of land.

Labor: Labor represents the human elements is production. The term labor means not merely the physical effort but also skill and judgment. Physical effort can be replaced by machine but the skills and judgment. Physical effort can be replaced by machines but the skill and judgment involves in labor, the work of the human mind, cannot be substituted. Any exertion of mind or body undergone partly or wholly for reward other than the pleasure derived directly from the work is called labor in this sense it includes the very highest professional skill of all kinds as well as the labor of unskilled workers and artisans. Man is the chief agent of production and all wealth is produced ultimately for him if labor remains unemployed it means degradation and poverty.

Capital: It refers to those goods, which are used for further production of goods. It is a wider concept than what the traditional definition means. It may be defined as any asset that generates a future flow of income. Defined in that way many goods normally considered as consumption goods may have to be classified as capital goods.

Entrepreneur: Entrepreneur is an economic agent who perceives market opportunities and organizes the other factors of production (land, labor, and capital) in the large firm the entrepreneur is a theoretical abstraction. Whose functions are divided between the management and shareholders

2)Production function

Production function is define the maximum amount of output the can be produced with a given set of inputs.

"Production function" is the technical relationship which reveals the maximum amount of output capable at being produced by each and every set of input, under the given technology of the firm.

The production function is purely a relationship between the quality of output obtained or given out by a production process and the quantities of different inputs used in that process. Production function can take many forms such as linear function or cubic function etc., production function is expressed mathematically as.

Q= f(Ld,Lb,K,M,T)
Where Q=out put
F=functional relation
Ld=Land
Lb=Labour
K=capital
M=Management
T=Technology

3. Types of production functions.

1. Short- run production function: short-run products function refers to that production function where in some factors a production are fixed and some factors are variables..

2Long-run production function: Long run production function refers to that production function where in all factors of production or inputs are variable.

Short-run production function

Production function with one variable input (or)

Law of variable proportion (or) law of returns: Production function with one variable input is explained with the help of law of variable proportions. The law is also called the law of diminishing marginal returns the law can be stated as follows "as the proportion of me in a combination a factor is increased after a point the average and marginal product of that factor diminish''. This law explains that when there a change in the proportion of factors or input used how the total output is affected.

This law states that is one input (variable factor is changed or increased keeping other factors of production Constant or fixed, the total output will increase in the initial stage at an increasing rate, and after reaching certain level of output will increases at diminishing rate it variable factor input is increase further the total output many decline the law got universal acceptance and it proved to be true in agriculture and manufacturing industry also.

The law of variable proportion exhibits the direction and rate of change in the firms output when the amount of only one factor (input) of production is changed.

The law can be explained with the of following table before going to the table we needto know few terms.

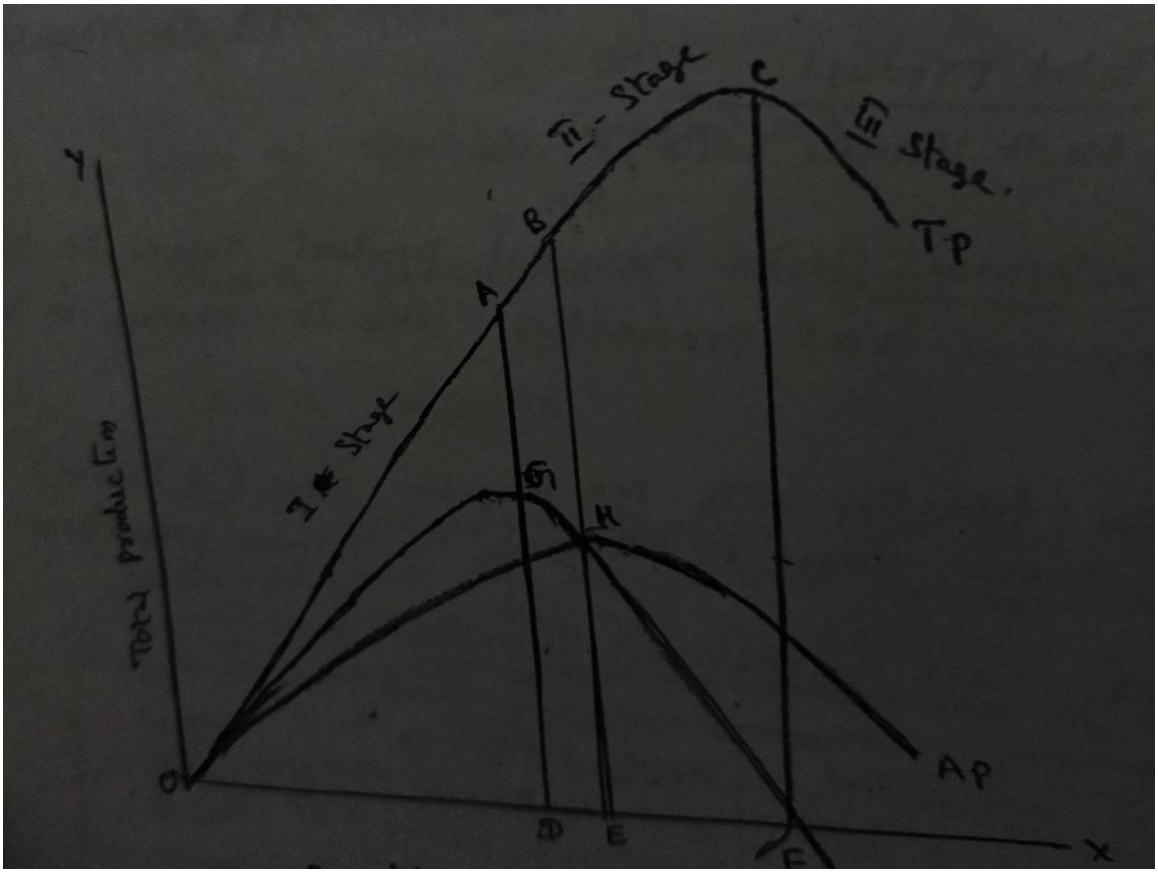
Total product (TP): Refers to the total output produced by all factor inputs.

Average product (AP): Average production refers to the total production divided bynumber of units of variable input.

Marginal product (MP): Marginal product refers to the rate of change in totalproduction due to change in variable input.

A production function with me variable input (i.e. labor) showing the three stages of the law of variable proportions.

Units of land (acrs)	Units of labour	Total product Quantity	Marginal product Quantity	Average product quantity	Stages
1	1	4	4	4	
1	2	10	6	5	1.stage
1	3	18	8	6	Increasing returns
1	4	24	6	6	2.stage
1	5	28	4	5.6	Decreasing(or)
1	6	30	2	5	Diminishing
1	7	30	0	4.2	returns
1	8	28	-2	3.5	3.stage
1	9	25	-3	2.8	Negativereturns



Stages - law of returns:-

Increasing returns- 1stage: Marginal product increasing as we use more units of the variable factors (labor) till OD units are employed. This is the first stage of the law popularly called .the stage of increasing returns (law of increasing returns). If we add more variable factor unit's marginal product start falling whereas average product raise so long as marginal product is above it. Both are equal to EH: when OE variable units are used here, the first phase ends

Diminishing or decreasing returns – 2 stage: The seconds stage of the law starts withthe employment of more units of the variable factor after OE both marginal and averageproduct of the factor start falling and marginal product become zero when OE units of variable factor is employed therefore, the second stage ends here . This second stage of the law is called the law of diminishing returns.

Negative returns – 3 stages: The third stage starts affect the employment of more than OE units. If more than OF units of labor are used .then they yield a marginal productivity less than zero. The additional units of labor employed in the third stage are not only redundant but harmful. Since they rather than help production. This is due to the fact in that the total product (TP) curve continues to fall in the third stage of the law this

Stages therefore termed as the stage of the law .this stage is therefore termed as thestage a negative returns (law negative returns).

Assumption the law of return:-

Constant technology: The law of variable proportion assumes that the employedtechnology in production process as constant.

Operation in short –run only: The law a variable proportions operates only the short – run become here only one factor is variable while the others are fixed.

Homogeneous factors: The law assumes that all the inputs are homogeneous oridentical in amount and quality.

3. Laws of returns to scale

The relationship between quantities of output and the scales of production in the long run, when all the inputs are increased in the same proportion is called law of returns to scale. In order to meet a long-run change in demand the firm increases its scale of production by increasing the quantities of all the factors (inputs) of production.

In case, all inputs are increased in the same proportion and the scale of production is expanded, the effect on output may take three forms. In other words, law of returns to scale have three forms of stages: increasing returns, constant returns and diminishing returns.

1. Increasing return of scale: every firm tries to earn more and more profit by multiplying its output. In order to increase the production additional doses of the factors of production i.e., scale of production is increased. Initially production increases at faster rate than increase in the input. it is evident from the following schedule that by applying additional dose of labour and capital (doubling the labour and capital) output increases from 10 units to 25 units. It shows that inputs increased by 100%, where as output increased by 150%. In the same way by doubling the dose of units, further production increased from 25 to 60 showing that input increased by 100% but the output increased by 140%. It shows the operation of law of increasing return.

2. Constant returns to scale: If the scale of production is further increased, it is fount that both input and output increase at equal rate i.e, at the same percentage. It is clear from our following schedule that by applying 3rd, 4th, and 5th doses of all factors of production, the increase in the output is constant i.e, at the same 100%.

3 decreasing return to scale: obtaining increase in the output at a percentage lower than the percentage increase in input is the operation of law of diminishing return to scale. In our following schedule. We find that by applying 5th, 6th, and 7th doses of input worth 100%each, output increases at lesser than 100%in each case. Show in operation of the law of decreasing return to scale

Laws of returns to scale have been further explained through the following schedule and diagram.

All the three stages of the law of returns to scale are explained in the following schedule and diagram.

Schedule 5.7. Showing returns to scale

Scale of production (units of labour and capital)	*Total production (units of goods)*	*Returns of scale*
1 Labour + 2 Capital	10	
2 Labour + 4 Capital	25	Increasing
4 Labour + 8 Capital	60	
8 Labour + 16 Capital	120	Constant
16 Labour + 32 Capital	240	
32 Labour + 64 Capital	400	Diminishing
64 Labour + 128 Capital	700	

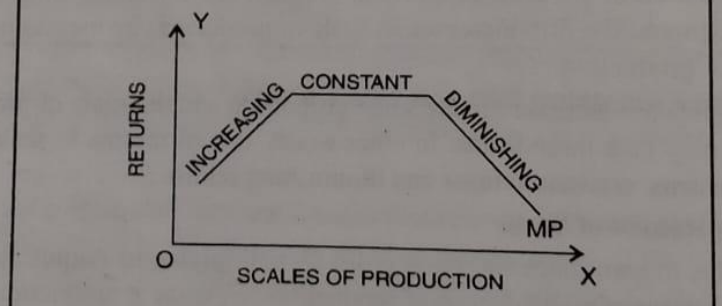


Fig. 5.5. Showing operation of the laws of returns to scale

4) Internal and external economies of scale:-

Production may be carried on a small scale or on a large by a firm. When a firm expands its size of production by increasing all the factors. It secures certain advantages known as economics of production these by marshal into internal economics and external economics.

1) **Internal economies:** internal economics are those benefits or advantages enjoyed by an individual firm if it increases its size and the output

Technical economies: A large firm can adopt and implement the new and latest technology. Which helps in reducing the cost of manufacturing process? Whereas the small firm many not have capability to implement latest technologies. A large firm can make optimum utilization of machinery and it can manage the production activities in continuous series without any loss of time there by saving the time and transportation cost.

Managerial economies: These benefits are obtained by large scale units. These enterprises

can afford to engage qualified and experienced professional managers. Who will plan, organize, coordinate, guide and control the activities effectively. It will lead to more production at lesser cost.

Labor economies: Labor economies are the economies arising out of division of labor or specialization .Expansion of the scale of production of the firm reduces the labor cost.

Through proper division of labor. Economies of division of occur due to the dexterity of every particular worker and introduction of machines enabling one worker to do many works cost of production decreases due to the skill, efficiency and productivity of labor.

Marketing economies: Economies arising out of the purchase of inputs and sales of output are called marketing economies expansion of the firm increases its bargaining power. It enables a firm to secure some benefits in its purchase and sales. A large scale firm claims certain advantages in the nature of price concessions, concessions in loading and unloading charges and concessions in transportation. Besides, it can profitably invest in sales promotion activities such as advertisement, sales man ship, propaganda and exhibition, all these result in marketing economies.

Financial economies: The benefits derived from a firm, in the money market, become of size and reputations are called financial economies. A large firm is always in a better position to commend credit at comparatively liberal rates because of its size. When the cost of obtaining credit reduces the cost of product itself decreases. The big firms can raise capital easily by issuing shares and debentures as the investors are usually interested to invest in big business ventures.

Risk bearing economies: The large firm can minimize the business rise because it produces a variety of products. The loss in one product line can be balanced by the profit in other product line.

Economies of welfare: An industry is in 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 sitting 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 labor is available to the industry. The will help the efficiencyof the workers.

2. External economies:-External economies are those benefits which are shared in by a number of firms in an industry. 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.

Economies of concentration: When an industry is concentrated in a particular area, all the member firms benefit some common economics like skilled labor, 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 ofthe entire firm in the industry.

Economies of information: The industry can set up an information center which may publish a journal and pass on information regarding the availability of raw material modern machines, export potentiality and provide other information needed by the firms. It will benefit all firms in an industry and this helps in raising the productive efficiency of the firms and reduction in their costs.

Economies of disintegration: The firms are an industry may also reap the economies of specialization. When an industry expand it becomes possible to split up some of the processes which are taken over by specialist firms. For example in the cotton textile industry. Some firms may specialist firms in manufacturing thread, other 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 field's increases and the unit cost of production falls.

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

5.1 Least- cost combination of input:-

When a consumer is faced with the problem of making choice between 2 or more goods with given resource constraints. Similarly the producer may face. The problem of choosing between different combinations of two or more inputs. The producer may reach an optimum point by choosing the least-cost combination of input.

The producers will choose that combination of inputs which produce maximum output at lowest cost.

Equal- marginal principle helps the produce in seeking the least-cost combination if a rupee spent on input A gives greater returns than a rupee spent on input B. Than the producer will spend more on input A than input B. the producer will go on substituting input A for input B. until the marginal product of both the inputs are equal. In this way the output is maximized the conditions for least-cost combination may be put in the following way.

$$\frac{\text{Marginal product of input X}}{\text{Price of input X}} \quad \text{(OR)}$$

$$\frac{\text{Marginal product of input Y}}{\text{Price of input Y}}$$

5.2. Iso quant or Iso product:

Iso mean equal, quant mean quantity, Isoquant as such mean the quantities throughout a given isoquant is equal .Isoquants are also called isoproduct cure.

Isoquant is a cure indicating combination of two input quantities which give equal quantity of production .in other words. An isoquant curve shows the various combinations of two input factors such as capital and labour which yield the same level of output. Hence following assumptions underline the isoquant curve.

1. Two input for labour and capital
2. No change in technology
3. Level of production remains the same.

The concept of iso- product can be explained with the help of following example

Combination	Capital (unit)	Labour (unit)	Output (units)
A	1	100	1000
B	2	70	1000
C	3	45	1000
D	4	25	1000
E	5	10	1000

The above table shows that as the input quantity of capital is increased the quantity of labour decreases due to fix resources available to the producer this can be depicted.

5.3 Marginal rate of technical substitution:

The slope of the isoquant has a technical name called"marginal rate of technical substitution" (MRTS)

The rate at which one factor of production (input) can be substituted for other is known as 'marginal rate of technical substitution' if we assumed two factors of production say labour and capital, than the marginal rate of technical substitution of capital for labour is the number of units of labour which can be replaced by one unit of capital, while the quantity of output remaining the same.

Combination	Capital (unit)	Labour (unit)	Output (units)
A	1	100	1000
B	2	70	1000
C	3	45	1000
D	4	25	1000
E	5	10	1000

For the example we assumed in the above table that an output of 1000 unit can be obtained with either applying 1unit of capital and 100 units of labour or by employing 2units of capital and 70 units of labour .this means, in the different combinations of inputs capital can be substituted for labour and yet we have the same output.

5.4 Cobb- Douglas production function:

Cobb and Douglas have undertaken an extensive survey in some manufacturing industries in America during 1940s to find out the relationship between the physical rates of input and physical rates of output. The general form of cob-Douglas production function may be described as.

Y= (AK

According to Cobb-Douglas .if the outputs ha to increase by 10% the input hasincrease in the same proportion.

Assumptions:

1. The function assumes that output is the function of two factors, viz, capital and lab ours.
2. There are constant returns to scale
3. All inputs are homogeneous
4 There is perfect completion
5. There is no change in technology.

5.5 Iso costs:

An isocost line identifies all combinations of capital and labour the firm can hire for a given total cost .Iso is from the Greek word meaning ‘equal’ so an isocost line is a line representing equal total cost to the firm .An isocost line represents a combination of inputs. Which all the cost the same amount. Although similar to the budget constraint inconsumer theory the use of isocost pertains to cost minimization in production asopposed to utility maximization. The isocost line is combined with the isoquant line to determine the optimal production point (at againlevel of output)

The typical isocost line represents the ratio of cost of labour and capital. So the formula is often written as.

Rk+Wl =C

Where

WL- represents the wage of Labour

RK- represents the rent of capital.

6) Cost concepts and cost behavior

Cost definition:-cost means the expense incurred on producing goods and services. Product makes use of different factors or inputs such as land, labour, capital, raw material ,power etc. the expenditure incurred on the inputs (factors) during the process of production is called cost. Cost of production includes rent, wage, interest and other input factors.

Classification of costs:-

1) Time base costs
2) Activities or volume base costs
3) Functional base costs
4) Controllability base costs
5) Decision making costs

1. Time base costs: - on the basis of the time of computing costs can be classified into historical and predetermined cost.

1. Historical cost: These costs are computed after they are incurred. Such cost available only after the production of a particular thing is over.

2. Predetermined cost: These costs are computed in advance of production on the basisof a specification of all factors influencing cost such costs may be.

2. Activities or volume base costs:-cost are also classified into fixed, variable and semi-variable on the basis of changeability of cost in the volume of production

1. Fixed cost: fixed cost is a cost which tends to be unaffected by variations in volume of output. Fixed cost mainly depends on the passage of time does not very directly with the volume of output. It is also called period cost. Examples are rent, insurance etc.

2. Variable cost: cost which tends to vary directly with volume of output is called variable cost it is a direct cost .it includes direct material, direct labour, direct expenses etc. Should be noted here that the variable cost per unit is constant but the total cost changes corresponding to the level of output .it is always expressed in terms of units and not in terms of time.

3. Semi – variable cost: These costs are partly fixed and partly variable. Because of the variable element they fluctuate with volume and because of the fixed element they do not change in direct proportion to output. Semi-variable or semi-fixed cost change in the same direction as that of the output not in the same proportion. For example the expenditure on maintenance is to a great extent fixed if the output does not change significantly .where; however, the production rises beyond a certain limit .further expenditure on maintence will be necessary although the increase in the expenditure

will not be in proportion to the rise in output. Other example in this are telephone rent, repairers etc.

3. Functional base costs:-on the basis of the functions carried out in a manufacturing concern, costs can be classified in to the following categories.

1. Manufacturing or production cost: It is the cost of operating the manufacturing division of an enterprise. It is defined as the cost of the sequence of operations which begins with supplying material, services and ends with the primary packing of the product.

2. Administration or office cost: It is the cost of formulating the policy, directing the organization and controlling the operations of an undertaking, which is not directly related to production, selling, distribution, research or development, administration cost. Thus, includes all office expenses, remuneration paid to managers direction, legal expenses, etc,.

3. Selling and distribution cost: Selling cost is the cost of seeking to create and stimulate demand eg; advertisement, showroom expenses, sales promotion, discounts to distributions, repairs and servicing expenses etc.,

4. Research and development cost: It is the cost of discovering new ideas, processes, and products by experiment and implementing such result on a commercial basis.

4. Controllability base costs:-

1.Controllable cost: A cost which can be influenced by the action of an undertaking is a controllable cost Eg: direct material, direct labor etc,.

2.Un controllable cost: A cost which cannot be influenced by the action of a specified member of an undertaking is an uncontrollable cost eg: rent, rates, taxes, salary, insurance etc.

5. Decision making costs: - Costs may be classified on the basis of decision making purpose for which they are put to use in the following ways.

1. Opportunity cost: It is the value of the benefit sacrificed of choosing a particular alternative. It is the costs of the best alternative foregone. If an owned building for example is proposed to be used for a new project, the likely revenue which the building could fetch. When rented out is the opportunity cost. It should be considered while evaluating the profitability of the project.

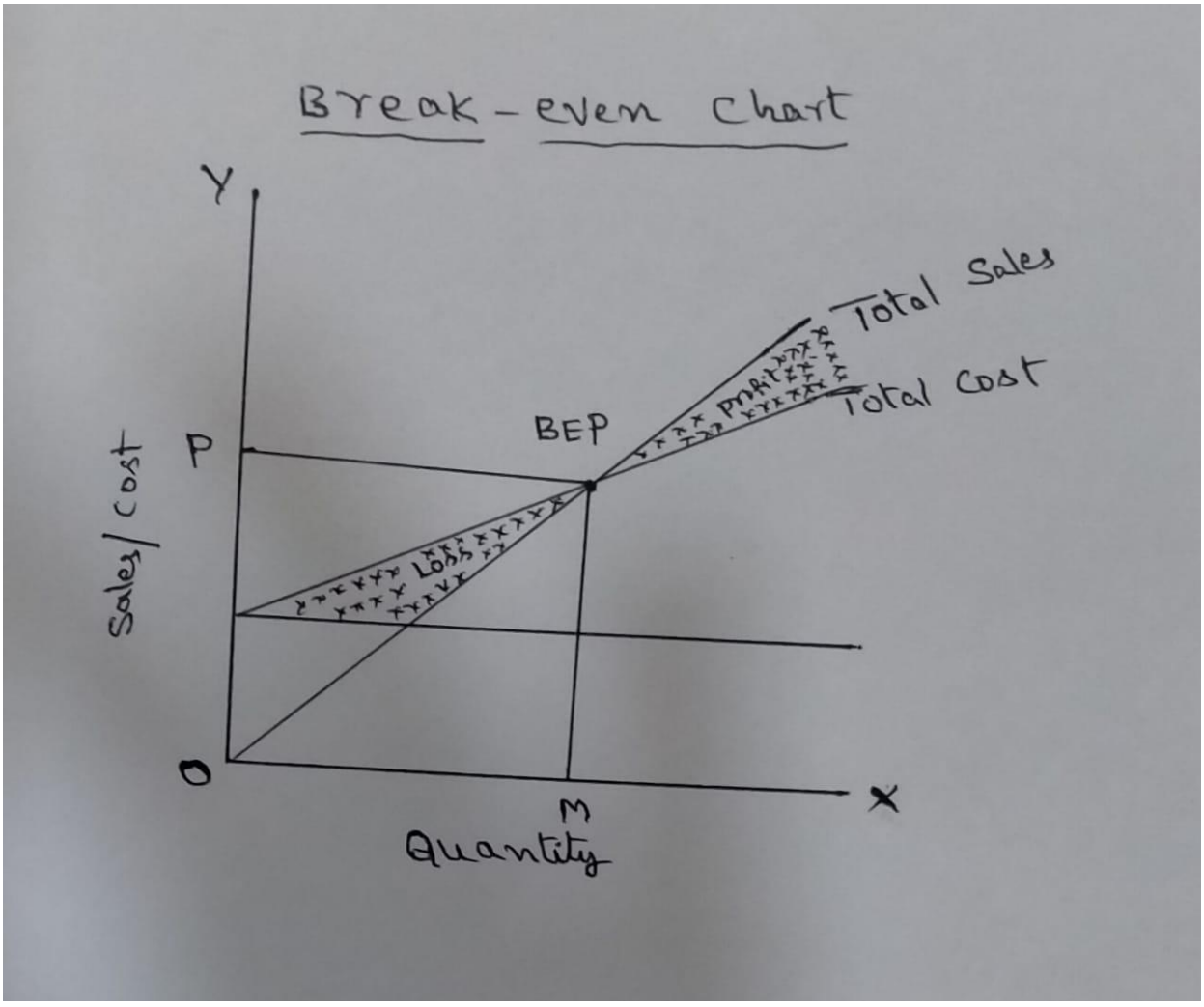
2. Sunk cost: A cost which was incurred or sunk in the past and is not relevant for decision making. It may also be defined as the difference between the purchase price of an assets and its salvage value.

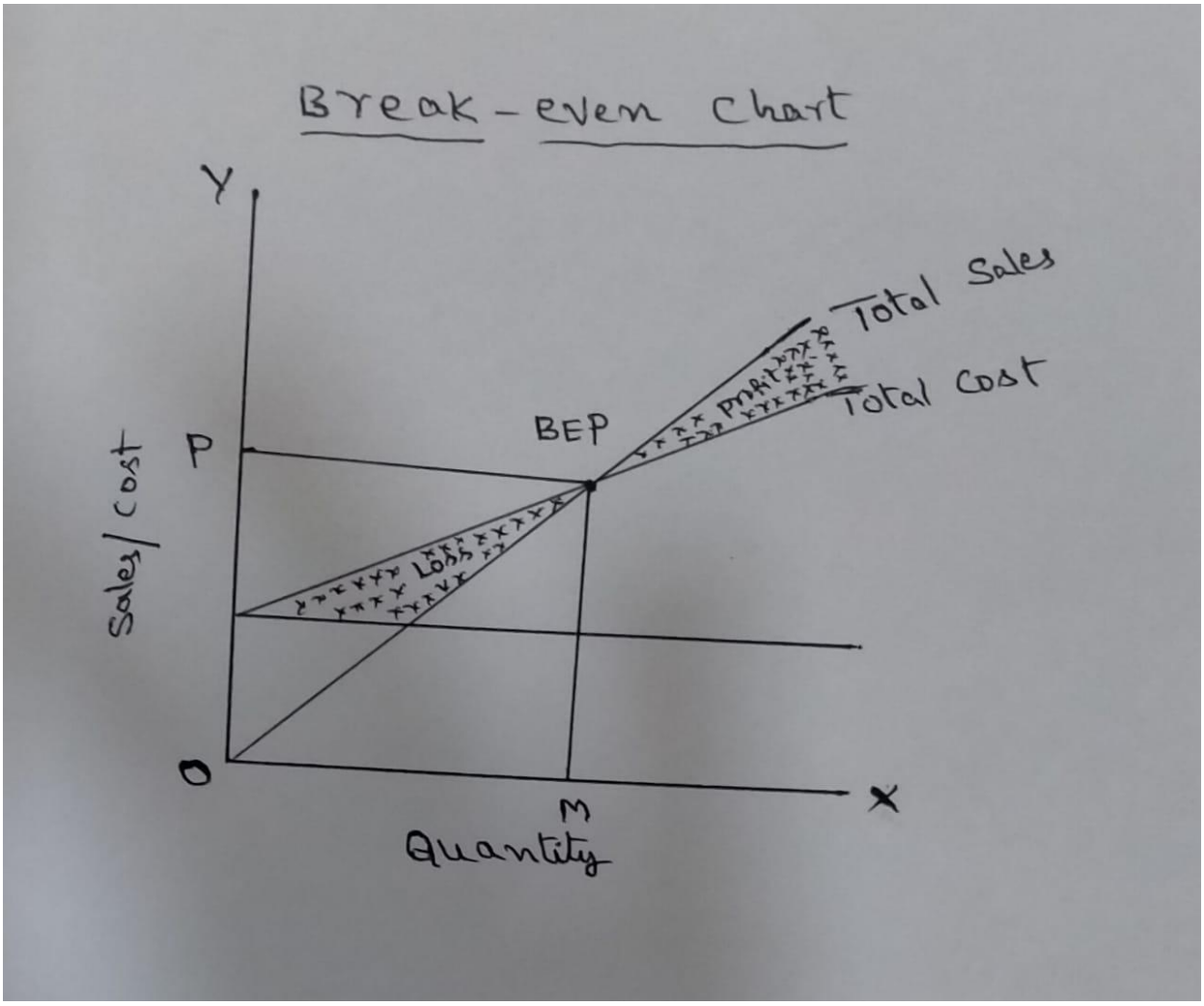
3. Joint cost: Whenever, two or more products are produced out of one and the same raw material or process, the cost material purchases and the processing are called joint costs. Technically speaking, joint cost is that cost which is common to the processing of joint products or by products up to the price of split off or separation.

4. Explicitly cost: the cost which involve outflow of cash due to the use of factors of production as explicitly cost. Example salaries, rent, advertisement, material, wage.etc**.**
5. Implicitly cost: the costs in which there is no cash outlay is known as simplicity cost. Example interest owner's capital, salary to owner, rent of owners building

1.Break even analysis

Break-even point:-The break – even point may be defined as that point of sales volume where total revenue is equal to total cost.i.e.,Point of no profit or no loss. If sales are higher than this point it means the business is earn the profits. On the other hand if sales are below this point means it is in losses. i.e. Breakeven point is equilibrium pointor balancing point of no profit no loss.





Assumption of break –even analysis

1. Cost can be segregated into fixed cost and variable cost
2. Total fixed cost remains the same
3. Variable cost per unit remains constant
4. The selling price does not change.
5. There is one product
6. There is a constant demand for the product.

Uses of break-even analysis:-

1. Information provided by the break even chart to be understands by the management more easily.
2. It helps the fix the sales volume
3. It helps the fore casting of cost and profit.
4. Profit abilities of various products can be studied
5. Helps determination of cost and revenue at various levels of output.

Limitations of break – even analysis:-

1 .It is based on short run cost

2. All the costs cannot be classified as fixed and variable cost

3. There are problems in application in a multiproduct firm.

IMPORTANCE FORMULAS (BEA)

1) Contribution:-the difference between price and variable cost is known as contribution. As following formula use for calculation of contribution

Contribution =selling price - variable cost

2) P/V Ratio (profit volume ratio):-is ratio of contribution to sales. As following formula use for calculation of P/V Ratio.

$$\text{P/v ratio} = \frac{\text{Contribution}}{\text{Sales}} 100$$

Or

$$\text{P/v ratio} = \frac{\text{Sales- variable cost}}{\text{Sales}} \times 100$$

Or

$$\text{P/v ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100$$

3) Breakeven point:-the break – even point may be defined as that point of sales volume where total revenue is equal to total cost. As following formula use for calculation of break - even point.

$$\text{Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution unit}} \quad \text{(or)} \quad \frac{\text{breakeven point (Rupees)}}{\text{selling price}}$$

Or

$$\text{Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

Or

$$\text{Break-even point (Rupees)} = \frac{\text{Fixed cost}}{\text{Contribution unit}} \times \text{selling price}$$

Or

Break-even point (Rupees) = break –even point units x selling price per unit

4) Margin of safety:-margin of safety is difference between actual sales and break-even point sales. As following formula use for calculation of margin of safety.

Margin of safety (Rupees) = sales – break-even point sales.

Or

Margin of safety (units) = sales units – break-even point units.

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/v ratio}}$$

5) Required sales:-required sales to expected profit formula as given below.

$$\text{required sales (Rupees)} = \frac{\text{Fixed cost + Expected profit}}{\text{P/ratio}}$$

$$\text{required sales (units)} = \frac{\text{Fixed cost + Expected profit}}{\text{Unit contribution}}$$

6) Fixed cost:-formula for calculation of fixed

cost. Fixed cost= sales x p/v ratio - profit

7. Profit:-formula for calculation of profit= sales x p/v ratio – fixed cost

1. **Problems:** The following information is extracted from the

Recodes of ABC Ltd.Fixed cost Rs 50000

Selling price /unit Rs 10

Variable cost/unit Rs 6

You are required to determine.

1).p/v ratio 2) break-even point in terms value (rupees) and volume (units)

3) Margin of safety when actual sales is 15000 units.

(December 2016)

Solution:

$$1.\ P/v\ ratio = \frac{Contribution}{Sales} 100$$

Contribution = selling price – variable cost

$$= 10 - 6 = 4$$

$$P/v\ ratio = \frac{4}{10} x100 = 40\%$$

$$2\ Break\text{-}even\ point\ (units) = \frac{Fixed\ cost}{Contribution\ unit}$$

$$Break\text{-}even\ point\ (units) = \frac{50,000}{4} = 12500\ units$$

$$Break\text{-}even\ point\ (rupees) = \frac{Fixed\ cost}{P/v\ ratio}$$

$$Break\text{-}even\ point\ (rupees) = \frac{50,000}{40\%} = Rs\ 125000$$

3 Margin of safety (units) = sales – break-even point sales

Margin of safety = 15000 – 12500

= 2500 units.

Problem 2.ACompany makes a single product with a sales price of Rs10 and a variable cost of Rs6 per unit. Fixed costs are Rs 60 000 calculate.

1. Profit – volume ratio.
2. Number of units to break –even
3. Break – even rupees
4. Sales to get a profit of Rs 10 000

Solution:

$$1.\ P/v\ ratio = \frac{Contribution}{Sales} \times 100$$

Contribution = selling price – variable cost

$$= 10 - 6 = 4$$

$$P/v\ ratio = \frac{4}{10} \times 100 = 40\%$$

$$2\ Break\text{-}even\ point\ (units) = \frac{Fixed\ cost}{Contribution\ unit}$$

$$Break\text{-}even\ point\ (units) = \frac{60000}{4} = 15000\ units$$

$$3.\ Break\text{-}even\ point\ (rupees) = \frac{Fixed\ cost}{P/v\ ratio}$$

$$Break\text{-}even\ point\ (rupees) = \frac{60000}{40\%} = Rs\ 150000$$

$$4.\ Required\ sales = \frac{Fixed\ cost + Expected\ profit}{P/ratio}$$

$$Required\ sales = \frac{60000+10000}{40\%}$$

$$= Rs175000$$

Problem3.if selling price per Unit Rs.12, variable cost per Unit Rs.8, fixed cost Rs.40000 find out.

1. p/v ratio
2. Break even sales units and value
3. Profit when sales are Rs. 3 00 000
4. Margin of safety when sales are Rs.3 50 000

Solution:

$$\text{1. P/v ratio} = \frac{\text{Contribution}}{\text{Sales}} 100$$

Contribution = selling price – variable cost

$$= 12 - 8 = 4$$

$$\text{P/v ratio} = \frac{4}{12} \times 100 = 33.3\%$$

$$\text{2 Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution unit}}$$

$$\text{Break-even point (units)} = \frac{40000}{4} = 10000 \text{ units}$$

$$\text{Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{40000}{33.3\%} = \text{Rs } 120000$$

3. Profit= sales x p/v ratio – fixed cost

Profit= 30000 x 33.3% – 40000

= 100000- 40000

= Rs60000

4. Margin of safety = sales – break-even point sales

Margin of safety =350000 – 120000

= Rs 230000

Problem4.from the following figures you are required to calculate.

1. p/v ratio
2. break – even sales value
3. margin of safety and
4. Profit.

Sales Rs.4 000, variable cost Rs.2 000, fixed cost Rs.1600.

Solution:

$$\text{1. P/v ratio} = \frac{\text{Contribution}}{\text{Sales}} 100$$

Contribution = selling price – variable cost

= 4000 - 2000

= Rs 2000

$$\text{P/v ratio} = \frac{2000}{4000} \times 100 = 50\ \%$$

$$\text{2. Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{1600}{50\ \%} = \text{Rs}3200$$

3. Margin of safety (units) = sales – break-even point sales

Margin of safety = 4000 – 3200

= Rs 800

4. Profit= sales x p/v ratio – fixed cost

Profit= 4000 x 50 % – 1600

= 2000- 1600

= Rs400

Problem 5.a firm has fixed cost of Rs.50 000, selling price is Rs.100 and variable cost is Rs.70.determine the 1).p/v ratio 2).break – even point in volume and sales. (June-2016)

Solution:

$$\text{1. P/v ratio} = \frac{\text{Contribution}}{\text{Sales}} 100$$

Contribution = selling price – variable cost

= 100 - 70 = 30

$$\text{P/v ratio} = \frac{30}{100} \times 100 = 30\%$$

$$\text{2. Break-even point volume (units)} = \frac{\text{Fixed cost}}{\text{Contribution}}$$

$$\text{Break-even point (rupees)} = \frac{50000}{30} = 1666.67 \text{ units}$$

$$\text{Break-even point sales (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{50000}{30\%} = \text{Rs}166667$$

Problem 6.from the following particulars, calculate.

1) p/v ratio.

2) Break – even point in terms of sales value and in units.

3)Number of sales that must be sold to earn a profit of Rs.90 000.

Fixed factory overheads cost Rs.60000,fixed selling overheads cost Rs 12 000,selling price per unit Rs.24, variable manufacturing cost per unit Rs 12,variable selling cost per unit Rs.3 (December 2017)

Solution:

Fixed cost:

Fixed factory overheads = 60000

Fixed Selling overheads =12000

Total fixed cost =72000

Variable cost

Variable manufacturing cost per unit = 12

Variable selling cost per unit = 3

Total variable cost per unit = 15

$$\text{1. P/v ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

Contribution = selling price – variable cost

= 24 - 15= 9

$$\text{P/v ratio} = \frac{9}{24} \times 100 = 37.5\%$$

$$\text{2 Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution unit}}$$

$$\text{Break-even point (units)} = \frac{72000}{9} = 8000 \text{ units}$$

$$\text{Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{72000}{37.5\%} = \text{Rs}192000$$

$$\text{3. Required sales} = \frac{\text{Fixed cost + Expected profit}}{\text{P/ratio}}$$

$$\text{Required sales} = \frac{72000+90000}{37.5\%}$$

$$= \text{Rs } 432000$$

Problem 7.Acompany makes a single product with a sales price of Rs 20 and a variable cost of Rs.12 per unit; fixed costs are Rs.1 20 000.calculate.

1) Contribution to sales ratio
2) Number of units to break even
3) Sales at breakeven point
4) What number of units will need to be sold to achieve a profit of Rs.20 000
5) What level of sales will achieve a profit of Rs.60 000.
6) Given a decrease in variable cost by 5% per unit, and increase in the fixed costs by Rs.20 000 per annum, what will be the new BEP in units?

(December 2014)

Solution:

$$\text{1. P/v ratio (contribution to sales ratio)} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

Contribution = selling price – variable cost

= 20 - 12 = 8

$$\text{P/v ratio} = \frac{8}{20} \times 100 = 40\%$$

$$\text{2 Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution unit}}$$

$$\text{Break-even point (units)} = \frac{120000}{8} = 15000 \text{ units}$$

$$\text{Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{120000 + 60000}{40\%} = \text{Rs}300000$$

$$\text{3. Required sales (units)} = \frac{\text{Fixed cost + Expected profit}}{\text{Contribution per unit}}$$

$$\text{Required sales (units)} = \frac{120000+20000}{8}$$

$$\text{Required sales (units)} = \frac{140000}{8}$$

$$= 17500 \text{ units}$$

$$\text{5. Required sales (rupees)} = \frac{\text{Fixed cost + Expected profit}}{\text{P/ratio}}$$

$$\text{Required sales (rupees)} = \frac{120000+60000}{40\%}$$

$$= \frac{180000}{0.4}$$

= Rs 450000

6. Calculation of new variable cost per unit

Variable cost per unit = Rs 12

Less: decrease in variable cost by 5% per unit (12x5%) = Rs 0.6

New variable cost per unit (12-0.6) = Rs 11.4

Calculation of new fixed cost:

Fixed cost Rs 120000

Add: increase in the fixed cost Rs 20000

New fixed cost (120000+20000) = Rs 140000

$$\text{New Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution unit}}$$

Contribution = selling price – variable cost

= 20 – 11.4 = 8.6

$$= \frac{140000}{8.6}$$

= 16280 units

Problem:8 the fixed cost of producing Moto-E mobile is Rs 100000 and variable cost per Moto-E mobile is Rs 3500 and the selling price of the same is Rs 4500.what should be the sales volume of the company to get Rs 20000 profits? (April 2022)

Solution:

$$\text{required sales (units)} = \frac{\text{Fixed cost + Expected profit}}{\text{Unit contribution}}$$

Unit contribution = selling price – variable cost

= 4500-3500
= Rs 1000

$$\text{required sales (units)} = \frac{100000+20000}{1000}$$

$$= \frac{120000}{1000}$$

=120 unit.

Problem 9.with the following information calculates.

1) P/V Ratio 2) fixed cost 3) BEP and 4) profit on estimated sales of Rs.1 25 000.

Year	Sales	profit
2015	1 00 000	15 000
2016	1 20 000	23 000

Solution:

$$\text{1. P/v ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100$$

Change of profit = 2016 profit – 2015 profit
= 15000- 23000 = Rs8000

Change of sales = 2017 sales – 2016 sales
= 120000 - 100000 = Rs20000

$$\text{P/v ratio} = \frac{8000}{20000} \times 100 = 40\%$$

2.Fixed cost= sales x p/v ratio – profit

Fixed cost= 100000x 40% - 15000
= 40000 -20000
= Rs25000

$$\text{3. Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{25000}{40\%}$$

$$\text{Break-even point (rupees)} = \frac{25000}{0.4} = \text{Rs}62500$$

4. Profit= sales x p/v ratio – fixed cost

Profit= 125000 x 40% – 25000

Profit= 50000 – 25000 = Rs25000

Problem10.the following information is given.

Year	Sales	profit
2016	160000	20000
2017	180000	25000

Calculate.1) p/vratio2) fixed cost

3) BEP sales.

4) Sales required to earning a profit of Rs.50 000.

5) Profit when sales are Rs2 00 000.

Solution:

$$1.\ P/v\ ratio = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100$$

Change of profit = 2017 profit – 2016 profit

= 25000- 20000 = Rs5000

Change of sales = 2017 sales – 2016 sales

= 180000 - 160000 = Rs20000

$$P/v\ ratio = \frac{5000}{20000} \times 100 = 25\%$$

2.Fixed cost= sales x p/v ratio – profit

Fixed cost= 160000x 25% - 20000

= 40000 -20000

= Rs20000

$$3.\ \text{Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{20000}{25\%}$$

$$\text{Break-even point (rupees)} = \frac{20000}{0.25} = Rs80000$$

$$4.\ \text{Required sales (rupees)} = \frac{\text{Fixed cost + Expected profit}}{\text{P/ratio}}$$

$$\text{. Required sales (rupees)} = \frac{20000 + 50000}{25\%}$$

$$\text{Required sales (rupees)} = \frac{70000}{0.25}$$

=Rs280000

5. Profit= sales x p/v ratio – fixed cost

Profit= 200000 x 25% – 20000

Profit= 50000 – 20000 = Rs30000

Problem11.the following data is obtained from the records of GRS pvt,ltd..

Period	Sales	Profit
1	2400000	400000
2	2900000	500000

Calculate.1) p/vratio2) fixed cost 3) BEP sales. (April 2022)

Solution:

$$\text{3. P/v ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100$$

Change of profit = profit (2) – profit (1)

= 500000- 400000 = Rs100000

Change of sales = sales (2) – sales (1)

= 2900000 - 2400000 = Rs500000

$$\text{P/v ratio} = \frac{100000}{500000} \times 100 = 20\%$$

4.Fixed cost= sales x p/v ratio – profit

Fixed cost= 2400000x 20% - 400000

=480000 -400000

= Rs80000

$$\text{3. Break-even point (rupees)} = \frac{\text{Fixed cost}}{\text{P/v ratio}}$$

$$\text{Break-even point (rupees)} = \frac{80000}{20\%}$$

$$\text{Break-even point (rupees)} = \frac{80000}{0.20} = \text{Rs}400000$$

Essay questions

1. Explain the law of variable proportions?
2. Explain the law of return to scale?
3. Explain different types of Internal and External economies of scale?
4. a) Explain the least cost combination of inputs. b) Explain the Cobb-Douglas production function
5. Explain different cost concepts.
6. Define B.E.P. Explain the Assumptions, significance and limitation of breakeven Point. It shows graphical presentation of B.E.A?

Short questions

1. What is break-even point?
2. Opportunity cost
3. What is meant by margin of safety?
4. Write the assumption s of BEA
5. Define isocosts.
6. What are laws of returns?
7. List out the external economies of scale.
8. What are the limitations of breakeven point?
9. Define cob-Douglas production function.
10. What are isoquants?
11. Explain the production function.
12. Distinguish between implicit and explicit cost.