

24/09/19

Unit : 03

### Theory of Production

Production is the process of converting an input to a more valuable output. Production is an aspect of supply side of market.

Production of good as well services all are included in the theory of production. The production theory is the efficient use of inputs for producing the desired output. This can be achieved either by using the min. input to produce a desired level of output.

#### Some terms in TOP -

fixed & variable inputs: A fixed factor is one that remains constant for a certain level of output. Variable input is one that changes with change in the output. In long run all the inputs are variable. In short run, supply of variable input is elastic.

(ii) Short run & Long run - Short run refers to a period of time in which the supply of certain inputs is fixed. Long run refers to a period of time in which supply of all the inputs is variable.

#### Production function -

It is a technological relationship b/w output and inputs. These inputs are also known as factors of production.

land, labour, capital, management and technology are the five major factors of production. The dependent variable O/P quantity is a function of independent variables i.e. factors of production.

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

An increase in any of these factors of production when other factors are constant will lead to increase in O/P. In other words all the partial derivatives of O/P function w.r.t inputs are positive.

#### A) Marshall's definition of factors of production-

- Land** :- The whole of the material and forces which nature gives free for man's aid in air, light, heat, water, etc.
- Labour** :- By labour we meant the economic work of a man either with the hand or with the head.
- Capital** :- Capital consists of these kinds of wealth other than free gifts of nature by which income is produced.

#### Type of Production function-

- fixed proportion / variable proportion production function - the amount of productive factor required to produce a unit of product remains fixed irrespective

If level of production is of fixed proportion form when the amount of factor required to produce a unit of product can be varied by substituting some other factor in its place the production function will be of variable proportion form.

ii) Linear and non-linear production function

iii) Cobb Douglas production function

$$Q = A L^\alpha K^\beta$$

$Q \rightarrow$  output

$L \rightarrow$  labour

$K \rightarrow$  capital

$\alpha, \beta, A \rightarrow$  constant

#### B) Short run Laws of Production : Production with 1 variable

The relation to a factor is the relationship b/w output and variation in one input while keeping the other factor inputs constant. This relationship is also called productivity of factor of production or law of return to a variable input. It is a short run relationship. Factor productivity plays an important role in managerial decision making. They are of 3 types-

- 1) Total physical Product (TPP) - It is defined as the total production

obtained by employing different quantum of that factor while all other factors are constant. It denotes the total output from a production system.

ii) Average physical product - It is the total physical product of that factor divided by the quantity of that factor while all other factors remaining constant.

$$APP_x = \frac{TPP}{X}$$

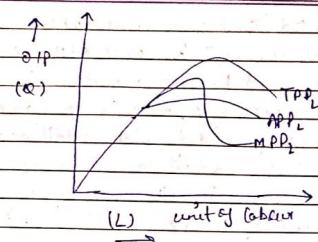
iii) Marginal physical product - It is the change in TPP due to the use of one additional unit of that factor of production while all other factors remaining constant.

$$(MPP)_x = \frac{\partial (TPP)}{\partial x}$$

For example, let us take two factors of production labour and capital. Capital is held constant at  $K = 10$  units and labour is changed from 1 unit to 5 units.

Capital (K)	Labour (L)	TPP	APP <sub>L</sub>	MPP <sub>L</sub>	Stages
10	1	20	20	-	1st increasing return
10	2	44	22	24	2nd diminishing return
10	3	75	25	31	2nd diminishing return
10	4	100	25	25	3rd negative return
10	5	110	22	10	3rd negative return

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Stage 1: TPP<sub>L</sub> increases with an increasing rate.

Stage 2: TPP<sub>L</sub> increases at a diminishing rate i.e. MPP<sub>L</sub> begins to decline.

Stage 3: TPP<sub>L</sub> decreases.

This behaviour of TPP is known as law of diminishing returns.

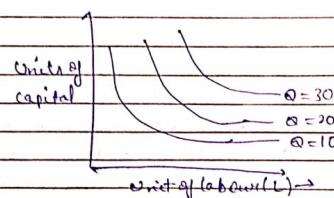
The law states that as the quantity of variable input increases, all other factors of production being constant, the resulting output increases but at a diminishing rate beyond a certain point. In other words, it states that marginal physical product first increases then decreases beyond a certain level of variable input; other factors remaining constant.

Consider the case of printing press. It has one press and one labour. If the capital is constant it means there is a single press and more limited raw material when more labour he has to do all the jobs many few.

Papers are printed but as more labour and utilised, its are distributed. This will increase OIP. However, if the labour is increased beyond a certain limit it will lead to confusion and excess of manpower as more labour is employed but not preceded with additional paper. In such case material labour addition will be less productive. Thus, the rate of increase in the no. of paper printed by additional unit of labour will fall. However, the total output will increase upto a certain limit.

### ISOQUANTS-

An Isoquant is defined as locus of all those combination of inputs when combined efficiently produce the same quantity of output.



### Characteristics-

- i) They have concave shape.
- ii) An Isoquant which is farther from origin represent higher output.
- iii) No two Isoquants ever intersect.
- iv) Isoquants are convex to the origin.
- v) Isoquants never touch axis.

### Long term laws of Production - Return to scale:

It contrast to the concept of short run returns to factor, returns to scale is a long term phenomenon. In law of return to factor, we have studied the production function when one of the inputs is change while others are constant.

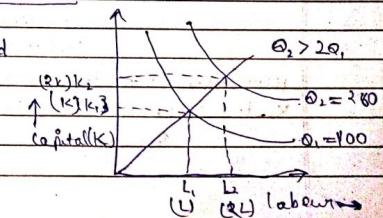
### Law of Return to scale -

The relationship b/w OIP and variation in all the inputs taken together is called returns to scale. It may be noted that all the factors of production are changed in the same proportion and in the same direction. It affects the optimum scale of operation of a firm and its production facilities. Returns to scale are measured by comparing the %age change in OIP with a %age change in all inputs. The returns scale is explained by two inputs and single output production system which can be examined to Isquent analysis.

Return to scale can be of 3 types -

#### (i) Increasing returns to scale -

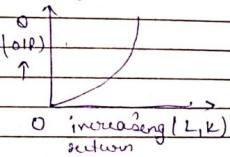
Here, when  $L_1$  is doubled to  $2L_1$  and when  $K_1$  is doubled to  $2K_1$  but OIP



The returns to scale are said to be Increasing if there is more than proportionate increase in O/P when compared to increase in the I/P. For example, a 20% gain in all the inputs, if the O/P also increases by more than 20%, then it is increasing returns to scale.

#### Reasons for increasing returns

- Technical and managerial indivisibility.
- Higher degree of specialisation



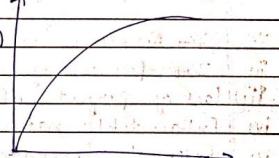
iii)

If the O/P increases in the same proportion as the increase of I/P; it is case of constant returns. For example, a 20% rise in all the inputs, if the O/P also increases by 20%, then its constant returns to scale.

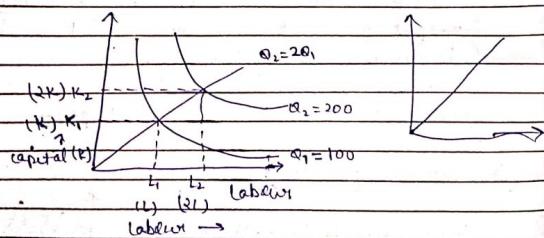
#### Diminishing returns to scale

Now, when  $L_1$  is doubled,  $Q \uparrow$  to  $Q_2$ , and when  $K_1$  is doubled to  $K_2$ , but  $O/P(Q) \uparrow$  is less than double.

$$Q_2 < 2Q_1$$



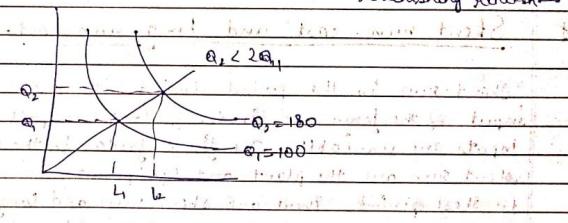
#### constant returns to scale



Now, when  $L_1$  is doubled to  $L_2$ , and when  $K_1$  is doubled to  $K_2$ , but  $O/P(Q)$  is exactly to double.

$$Q_2 = 2Q_1$$

For Increasing returns to scale, the O/P increases in exactly proportion than the increase in the I/P. In diminishing returns to scale there is less than 20% increase in O/P corresponding to 20% rise in all inputs.



### Law of diminishing returns

As the proportion of one factor in a combination of factors increases then after a point the marginal & average product of that factor will diminish.

### Causes of law of diminishing returns to scale-

- i) Increasing economies of production
- ii) Improper use of factors of production
- iii) Lack of perfect substitutability b/w factors
- iv) Exhaustible natural resources
- v) External diseconomies

### Short run cost and long run cost

Short run is the period during which one or more inputs of the firm are fixed. In long run, all the factor inputs are variable. The fixed factor in the case of short run are the plant and equipment corresponding to these period. There are short run and long run cost. A short run cost is the cost that varies with the OLP when plant and equipment remains the same in contrast.

Long run cost is the cost that varies with OLP when all the factors inputs change.

### Short run cost curve

The short run cost OLP relationship explain the behaviour of cost with varying level of outputs in the short run it helps to determine the cost at different output levels for a given scale of operation since in the short run we have both fixed cost and variable cost. So the total cost is equal to the sum of both fixed cost and variable cost.

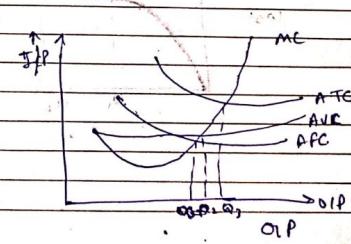
The total cost for the short run is given by,

$$\text{Total cost, } TC = TFC + TVC$$

$$\text{Avg. cost, } AC = \frac{TC}{Q}$$

$$\begin{aligned} &= \frac{TFC + TVC}{Q} \\ &= AFC + AVC \\ \text{Marginal Cost, } MC &= ATC/Q \\ &= \frac{ATC}{\Delta Q} \quad (\text{since } TFC \text{ is fixed hence const}) \end{aligned}$$

Behaviour of TC, TVC, TFC, AC, AFC, AVC and marginal cost



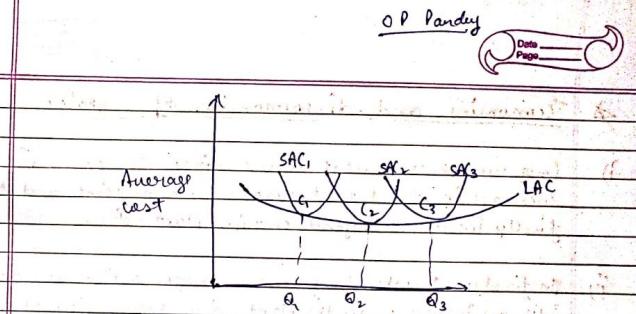
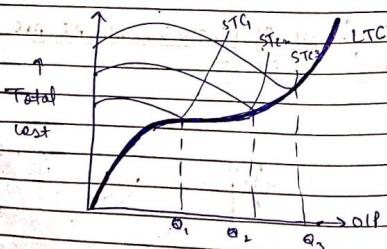
The total fixed cost remains constant with an increase in the output. Therefore the average fixed cost decreases but this decrease is not linear the rate of fall of average fixed cost goes on decreasing as QP increases. The total variable cost increases with an increase in the output, it increases in variable proportion.

- (d) At a diminishing rate for a certain range of output and then at an increasing return.

The law of diminishing return forms the basis of this behaviour.

#### Long run cost curves

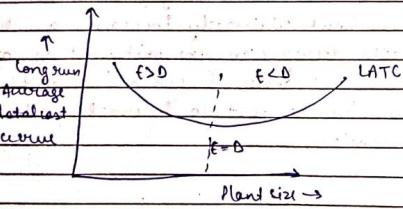
In the context of production theory, long run is defined as a period in which all the inputs become variable. Long run is composed of series of short run cost curve.



LTC can be drawn through the minimum points of STC<sub>1</sub>, STC<sub>2</sub> and STC<sub>3</sub>. A long run average cost curve can be drawn through SAC<sub>1</sub>, SAC<sub>2</sub> and SAC<sub>3</sub>. The long run average cost curve is also known as envelop curve or planning curve with a subsequent increase in the QP, the long run total cost curve first increases at a decreasing rate and then at an increasing rate; as a result LAC initially decreases until the optimum utilization of input and then it becomes to increase. These cost output relation follows the law of returns to scale. When the scale of the firm expands unit cost of production initially decreases but ultimately increases as shown in the fig. the decrease in the unit cost is attributed to external and internal economies and eventual increase in the cost to internal and external diseconomies.

### Economies and diseconomies of scale -

- long run average cost curve first decreases with an increase in the output reaches a min point and then finally increases beyond certain plant size.
- In first part when long run average cost curve decreases with an increase in the plant size economies of scale set to exist.
- Diseconomies of scale arises when long run average cost curve rises with an increase in the plant size.
- At optimal plant size, economies of scale equals diseconomies of scale.
- Increasing returns to scale operate till  $F > D$  (economy) decreasing returns to scale operate when  $F < D$  when economies and diseconomies are in balance returns to scale are constant ( $F = D$ )



### Factors causing economies of scale -

- Internal factors-
  - Specialised labour
  - higher quality machines
  - Bulk discount in purchase of inputs like raw material etc.
  - low cost funds
  - marketing and distributions
- External factors-
  - Better transportation facilities
  - Better repair & maintenance
  - Common research and development
  - Recreational and educational facilities for families of employes

### Diseconomies of scale -

- Internal factors-
  - labour unions
  - difficulty in team work
  - loss of coordination
  - difficulty in raising funds
- External factors-
  - Beyond certain size level, most of the economy turns into diseconomies

## UNIT : 04

### Basis of Market System for market equilibrium -

A business operates in a market i.e. market is to play field for a manager. The market for a product works on certain market principles, i.e. laws that govern the working of the market system also called market mechanism. The working of the market system is governed by certain fundamental laws of market called the laws of demand and supply.

A market is a mechanism by which buyers & seller interact to determine the price and quantity of a good or service. The sellers & buyer may be individuals, firms, factories, dealers & agents.

### Characteristic feature of market -

- i) Commodity - For existence of the market a commodity is essential which is to be bought & sold. There cannot be a market without commodity.
- ii) Buyers & sellers - Without buyers & seller the same purchase activity can't be conducted which is essential part of a market.
- iii) Area - There should be an area in which buyers & sellers of the commodity exist. It is not essential that buyers & sellers should come to particular place to transact business.

Close contacts - There should be close contact & communication between buyers & sellers. This communication may be established by any method not necessarily by physical contact.

Competition - There should be some competition among buyers & sellers of commodity in the market.

Perfect knowledge of market - Buyers & sellers must have perfect knowledge of the market regarding the demand of the customers, their habits, past, taste, fashion etc.

viii) Sound monitoring system - It should be prevalent in the market. It means money exchange system if possible should be sound for the customers.

### Classification of the market -

i) Local market - When competition between purchasers and seller localise and limited at a specific market then it is called local market. In this market mostly perishable goods are purchased and sold. For ex. sale of vegetables, fish, eggs, milk etc.

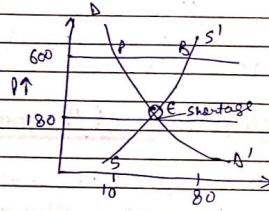
ii) Regional market - Sale and purchase of the article is localise to state only and not outside state in this market.

National market - It is that market in which demand of the good is in the nation as a whole where you are living. For ex. Hindi books in India can have national market.

International market - If competition of good is worldwide, the market will be international. Gold and silver are the examples of the commodities that possess an international market.

### Market Equilibrium

It is the state of a market in which quantity demanded of commodity equals the quantity supplied by the commodity. The equality of demand and supply produces an equilibrium price.



P	D	S	Market position	Effect on price
100	80	10	Shortage	Rise
200	55	28	"	Rise
300	40	40	Equilibrium	Stable
400	25	50	Surplus	Fall
500	20	55	"	Fall
600	15	60	"	Fall

In a free market, disequilibrium itself creates the condition for equilibrium when there is excess supply, it forces downward adjustment in the price and quantity supplied. When there is excess demand, it forces upward adjustment in the price and quantity demanded. The process of downward and upward adjustment in the price and quantity continues till all the equilibrium is reached. This process of tries and quantity adjustment is called market mechanism.

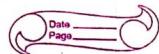
### Market Structure & types of market

The nature and degree of competition makes the structure of the market depending on the no. of sellers and degree of competition, the market can be broadly classified as -

1. Perfect competition
2. Imperfect competition
  - a) Monopolistic
  - b) Oligopoly
  - c) Monopoly

Assumption	Perfect competition	Monopolistic competition	Oligopoly	Monopoly
No. of sellers	Large	Many	Few	One
Product differentiation	(None)	Slight	Little or no product differentiation	A single producer
Degree of control over price	None	Some	Some	Considerable and regulated
Price elasticity of demand of firms	Infinitely elastic	Large & small	Small	Zero

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### \* Characteristics of Perfect Market Competition -

#### i) Large number of Buyers and sellers :-

No. of buyers & sellers must be so large that none of them individually is in a position to influence the price and output of industry as a whole. The demand of an individual buyer relative to the total demand is so small that he can't influence the price of the product by his individual action.

#### ii) Homogeneity of products -

Each firm should produce an homogeneous product so that no buyer has any preference for the product of any individual seller over others. This is possible only if units of the same product produced by different seller are perfect substitute of each other.

#### iii) Free entry & free exit of firms -

The firms should be free to enter & leave the industry. It means that whenever the industry is earning handsome profits attracted by these gains some new firms enter the industry. In the case of less profits of the industry some firms leave. This condition is very true in the long run when all the firms must earn normal profits.

#### iv) Perfect mobility of factors of production & goods -

There should be perfect mobility of good & factors in the industry. Goods should be free to move to those places where they can get the highest price. Factors can also move

from low paid to high paid industry.

#### v) Perfect knowledge of the market -

Buyers and sellers must possess complete knowledge about the price of the goods which are being bought and sold and of the price at which others are prepared to buy & sell. They should also have perfect knowledge of the place where transactions are being carried on. Advertisement & selling technique don't affect the market buyers preferences.

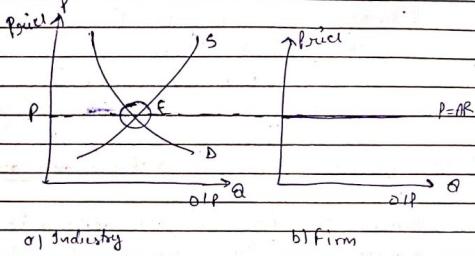
#### vi) Absence of price control or any artificial restraint -

There should be complete openness in buying & selling of the good. Sellers are free to sell their goods to any buyers and buyers are free to buy from any seller. In other words there should be no discrimination on the part of buyers & sellers. His prices are liable to change freely in response to demand & supply conditions.

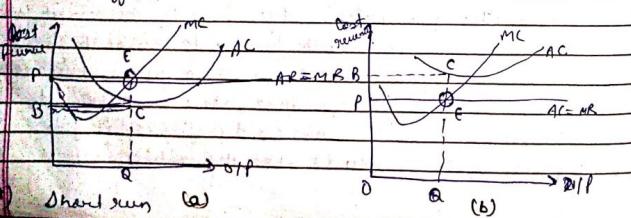
### \* Price determination under various market conditions -

Under perfect competition a large no. of firms compete against each other. The price is determined by the market forces of demand & supply and the firm has to accept the price determined by the market forces. If a firm uses its power to fix the price of its product above or below its market level it loses its revenue and profit for if it fixes the price of its products above the ruling price it will not

be able to sell its products and if it sets the price below the market level, it will not be able to recover its average cost. In a perfectly competitive market firms have little or no choice in respect to price determination. Although market participant have to take the price that is given to them i.e. buyers & sellers are price takers not price makers.



In a perfectly competitive market, the main problem for a profit maximising firm is not to determine the price of its product but to adjust its output to the market price so that profit is maximum. The mode of price determination depends on the time taken by the supply position to adjust itself to the changing demand position. Therefore, price determination under perfect competition is analysed under different time periods.

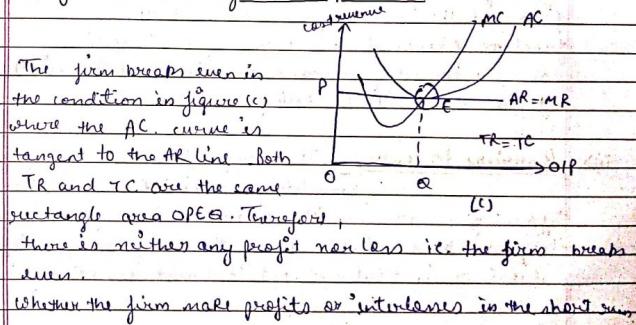


$$OPEQ \rightarrow TR \text{ (Total revenue)} \\ OBCQ \rightarrow TC \text{ (Total cost)}$$

Figure (a): It is the case of the firm making profit in the short run. It has a cost curve such that it lies always below the average revenue curve. The point of intersection of marginal cost and marginal revenue curves at the equilibrium point E. Here the area of rectangle OBEQ represents total revenue while area of OACQ represents total cost. In this case  $TR > TC$ , therefore the difference in the two  $TR - TC$  is given by  $TBCE$  which is the profit made by the firm in the short run.

Figure (b): Similarly in (b)  $TR$  is the area of  $OPEQ$  and  $TC$  is  $OBCQ$ . The difference in the two i.e. area of rectangle  $PBCE$  gives the loss incurred by the firm in the short run.

### Long run in perfect competition-



The firm breaks even in the condition in figure (c) where the  $AC$  curve is tangent to the  $AR$  line. Both  $TR$  and  $TC$  are the same rectangle area  $OPEQ$ . Therefore,

there is neither any profit nor loss i.e. the firm breaks even.

Whether the firm make profits or intakes in the short run,

will depend on its cost structure. It'll be a measure of efficiency of production while efficient firms will be able to make profits by cutting down the cost of production. Inefficient firm will end up incurring losses and this happens only in short run. In the long run no firm makes profit or loss. They all break even.

#### \* Characteristics of Monopoly -

- i) Single seller of the product: In a monopoly market there's only one firm producing or supplying a product. This single firm constitutes the industry and as such there is no distinction b/w the firm and the industry in a monopolist market.
- ii) No close substitutes: The monopolist sells a product which has no close substitutes. The firm or the company is the industry itself. The demand curve of monopoly firms will be downward sloping since the firm and the industry are one and the same demand function. Hence demand curve of a monopolist firm will be same as industry demand function and curve that is why the curve will be falling.
- iii) Barriers to entry: The entry into the industry is completely restricted or made impossible if new firms are admitted into the industry monopoly itself breaks down. This ban on the entry may be legal, natural or institutional but it must essentially be there.

iv) Independent price policy: Monopolist firm can adopt TPP i.e. it can increase or decrease price as it likes. The downward sloping shape of AR curve clearly indicates that a monopoly firm is a price maker.

v) Price discrimination: Under monopoly, price discrimination is possible it implies that monopolist can sell its product at different prices to different customers.

\* Difference b/w perfect competition and monopolistic competition -

#### Perfect competition

i) There are large no of firms

ii) Homogeneous product

iii) A firm can't have independent price policy; it is price taker not the price maker

iv) Perfect mobility of factors of production

v) AR and MR curves are one and the same thing and lie on X-axis.

#### Monopolistic

There are many firms

Product differentiation

A firm can have independent price policy. It is price maker

No perfect mobility of factors of production

AR and MR curves are downward sloping and MR remains below AR

### Monopoly

- i) Single firm
- ii) Homogeneous product.

iii) No close substitute of the commodity

iv) Price discrimination is possible

- v) Complete restriction on the entry of the firm hence monopoly firm earns super normal profits in long run as well.

### Price determination under monopoly market

Monopoly exists when there is a single firm selling a product that has no close substitute hence the firm or company is the industry itself. The demand curve of monopoly curve will be downward sloping since the firm and the industry are one and the same the demand of M and hence the demand curve of monopolist firm will become as industry demand function curve that is why the curve will be falling.

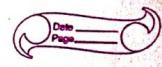
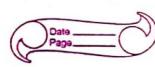
### Monopolistic

- Many firms
- Product differentiation

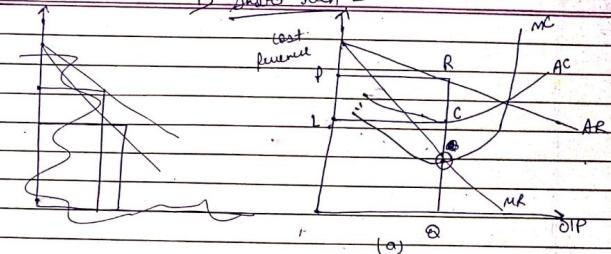
many close substitute.

Price discrimination by an individual firm is not possible

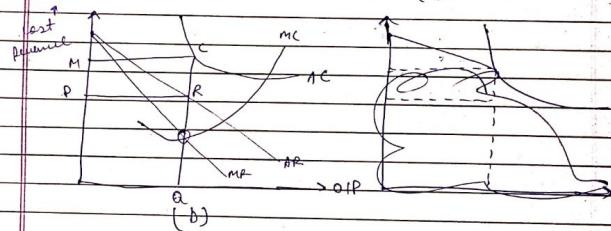
Freedom of entry hence there's no super normal profit in the long run



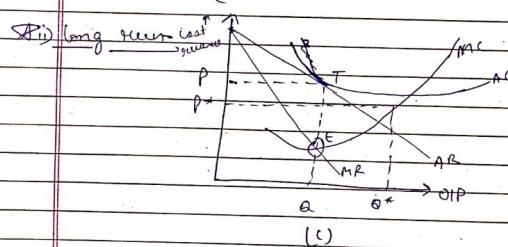
→ Short run -



(a)



(b)



(c)

In the equilibrium point under the conditions of profit maximization it is the point of intersection of  $MR$  and  $MC$  curves. Figures (a), (b) and (c) are the situations of profit, loss and break even respectively.