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Market

<https://www.economicdiscussion.net/perfect-competition/equilibrium-of-the-firm-and-industry-under-perfect-competition/18579#>

Refers to a Product or Service for the buying and selling of which the buyers and sellers come into contact.

Markets: are the institutions in which buyers & sellers are brought into contact for the purpose of engaging in exchange.

PERFECTLY COMPETITIVE MARKET

A market is said to be perfectly competitive when each firm has *zero market power*. **Market power** refers to the power to influence market prices or the terms on which individual firms sell their product.

In perfect competition many firms sell an identical /homogeneous product & each must accept the price set by the forces of market demand and supply.

Thus, perfect competition is a market structure characterised by the complete absence of rivalry among the individual firms.

The model of perfect competition rests on three basic assumptions:

- (1) price taking,
- (2) product homogeneity, and
- (3) free entry and exit.

Price Taking

Because *each individual firm sells a sufficiently small proportion of total market output, its decisions have no impact on market price.*

- **price taker** Firm that has no influence over market price and thus takes the price as given.

PERFECTLY COMPETITIVE MARKETS

Free Entry and Exit

- **free entry (or exit)** Condition under which there are no special costs that make it difficult for a firm to enter (or exit) an industry.

Product Homogeneity

When *the products of all of the firms in a market are perfectly substitutable with one another—that is*, when they are *homogeneous*—no firm can raise the price of its product above the price of other firms without losing most or all of its business.

Features or assumptions of Perfectly Competitive Market

- 1) Large Number of Buyers & Sellers:
- 2) Homogeneous Product:
- 3) Freedom of Entry & Exit:
- 4) Price Takers:
- 5) Profit Maximisation:
- 6) Absence of Collusion:
- 7) Absence of Government Regulation:
- 8) Absence of Selling Costs:
- 9) Perfect Knowledge:
- 10) Perfect Mobility of Factors of Production:

However, the market structure in which the above 1st eight features are fulfilled is called ***Pure Competition*** & the ***perfect competition*** requires the fulfilment of the additional last two assumptions (i.e. Perfect Knowledge & Perfect Mobility of Factors of Production).

Assumptions:

1. All firms use homogeneous factors of production.
 2. Firms are of different efficiency.
 3. Cost curves of firms vary from each other.
 4. All firms sell their products at the same price determined by demand and supply of the industry so that the price of each firm, P (Price) = $AR = MR$.
 5. Firms produce and sell different quantities.
- The short-run equilibrium of the firm can be explained with the help of marginal analysis and total cost- total revenue analysis.

Demand Curve, ARC, MRC & Prices: in Perfectly Competitive Market (PCM)

As we know, in perfect competition (PC) a firm can sell its entire output at the prevailing market price. Because a firm is a price taker. Thus each firm faces a demand (D) curve that is *perfectly horizontal* because variations in the firm's output have no effect on price.

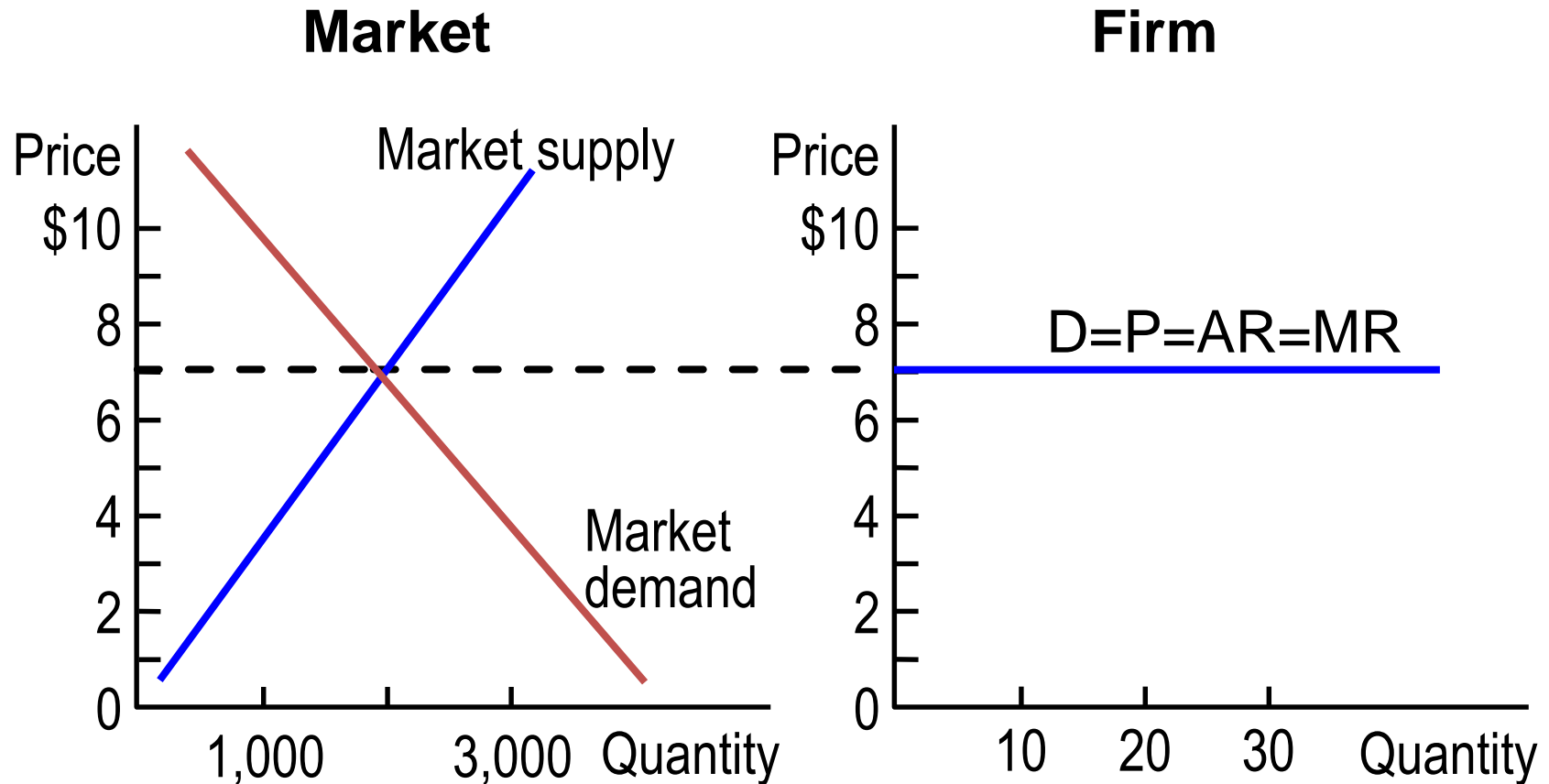
Since price (P) is constant in PC, thus the average revenue (AR) of the firm must be the same as price.

As we know, AR is the total revenue divided by the number of unit sold. Thus, AR is the price of the commodity & the AR curve will coincide with the demand curve.

Similarly, we know that marginal revenue (MR) is the change in total revenue resulting from the sale of an additional unit of output. Since an additional unit is sold at the same price in PC, thus, the MR is equal to the price & MR will coincide with AR on the horizontal demand curve.

Therefore, in PC the DC, AR, MR & Price of the firm are same, i.e., $D=P=AR=MR$.

Market Demand Versus Individual Firm's Demand Curve for a Competitive Market



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Price & Output Determination in Perfect Competition

Condition for a Firm's Equilibrium:

- **Marginal Cost (MC) = Marginal Revenue (MR)**
- **MC should intersect MR from below (i. e., Slope of MC should be more than that of MR)**

Condition for Industry Equilibrium:

Market Demand = Market Supply

Equilibrium of the Firm and Industry under PCM

Meaning of Firm:

Firm is an organisation which produces and supplies goods that are demanded by the people with the goal of maximising its profits.

According to R.L.Miller, “*Firm is an organisation that buys and hires resources and sells goods and services.*” To Lipsey, “*Firm is the unit that employs factors of production to produce commodities that it sells to other firms, to households, or to the government.*”

Meaning of Industry: *Industry is a group of firms producing homogeneous products in a market.* According to Lipsey, “**Industry is a group of firms that sells a well-defined product or closely related set of products.**” For example, Raymond, Maffatlal, Arvind, etc., are cloth manufacturing firms, whereas a group of such firms is called the textile industry.

Conditions of Equilibrium of the Firm and Industry:

A firm is in equilibrium when it has no tendency to change its level of output. It needs neither expansion nor contraction.

(1) **The MC curve must equal the MR curve.** This is the first order and necessary condition. But this is not a sufficient condition which may be fulfilled yet the firm may not be in equilibrium.

(2) **The MC curve must cut the MR curve from below and after the point of equilibrium it must be above the MR.**

This is the second order condition.' Under conditions of perfect competition, the MR curve of a firm coincides with the AR curve. The MR curve is horizontal to the X- axis. Therefore, the firm is in equilibrium when $MC=MR=AR$ (Price).

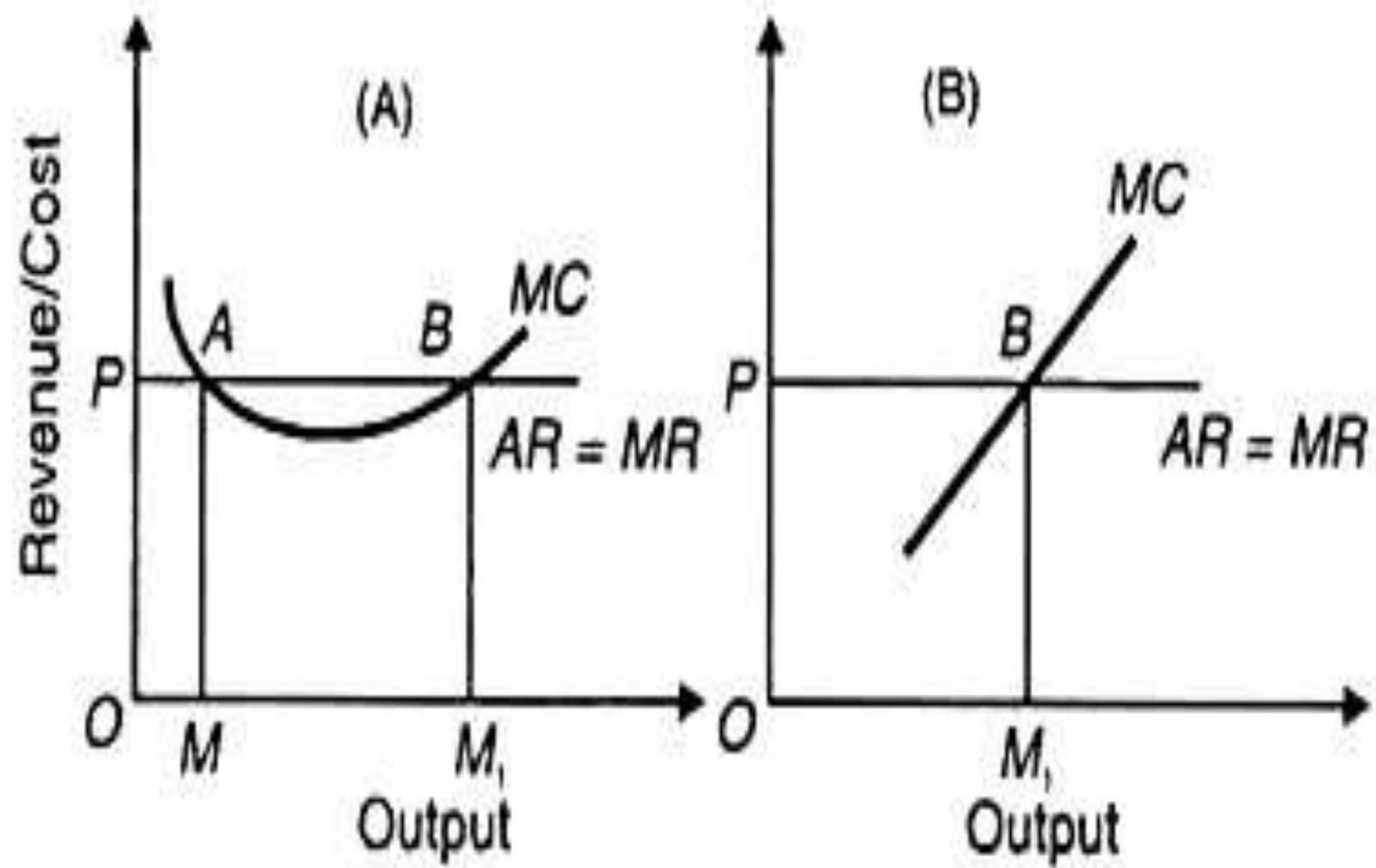


Fig. 1

In Figure 1(A), the MC curve cuts the MR curve first at point A. It satisfies the condition of $MC = MR$, but it is not a point of maximum profits because after point A, the MC curve is below the MR curve. It does not pay the firm to produce the minimum output OM when it can earn larger profits by producing beyond OM.

Point B is of maximum profits where both the conditions are satisfied. Between points A and B, it pays the firm to expand its output because it's $MR > MC$. It will, however, stop further production when it reaches the OM_1 level of output where the firm satisfies both the conditions of equilibrium.

If it has any plans to produce more than OM_1 it will be incurring losses, for its marginal cost exceeds its marginal revenue beyond the equilibrium point B. The same conclusions hold good in the case of a straight line MC curve as shown in Figure 1. (B)

An industry is in equilibrium: firstly when there is no tendency for the firms either to leave or enter the industry, and secondly, when each firm is also in equilibrium.

The first condition implies that the average cost curves coincide with the average revenue curves of all the firms in the industry. They are earning only normal profits, which are supposed to be included in the average cost curves of the firms.

The second condition implies the equality of MC and MR. Under a perfectly competitive industry these two conditions must be satisfied at the point of equilibrium, i.e.

$$MC = MR \dots (1)$$

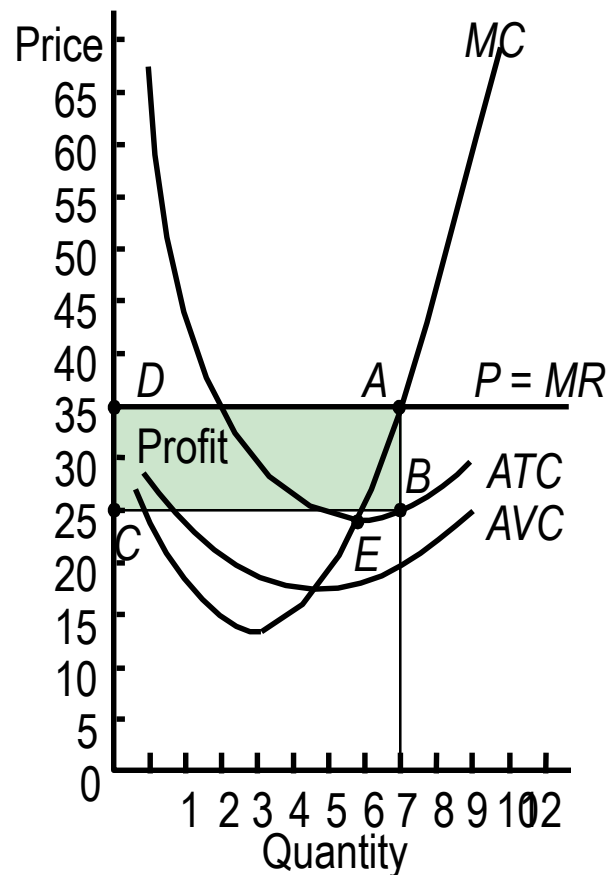
$$AC = AR \dots (2)$$

$$AR = MR$$

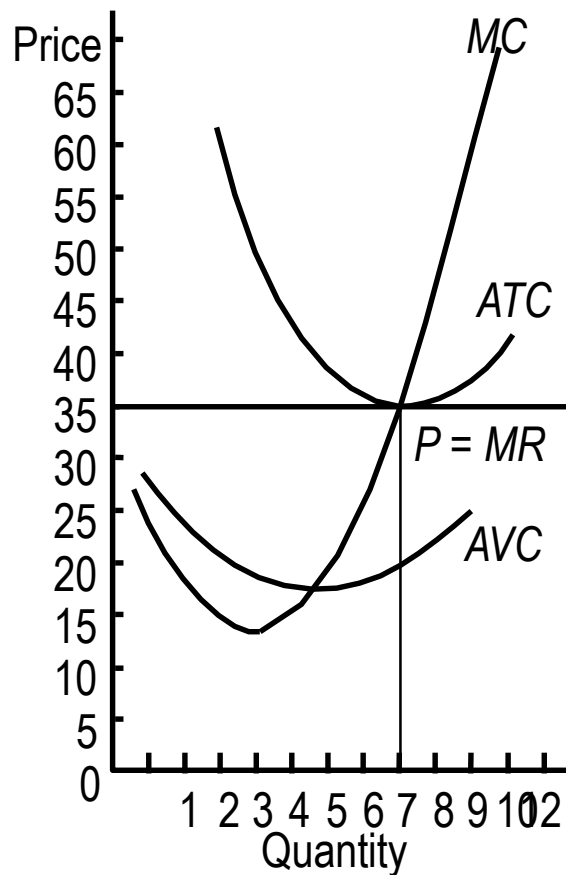
$$MC = AC = AR$$

Such a situation represents full equilibrium of the industry.

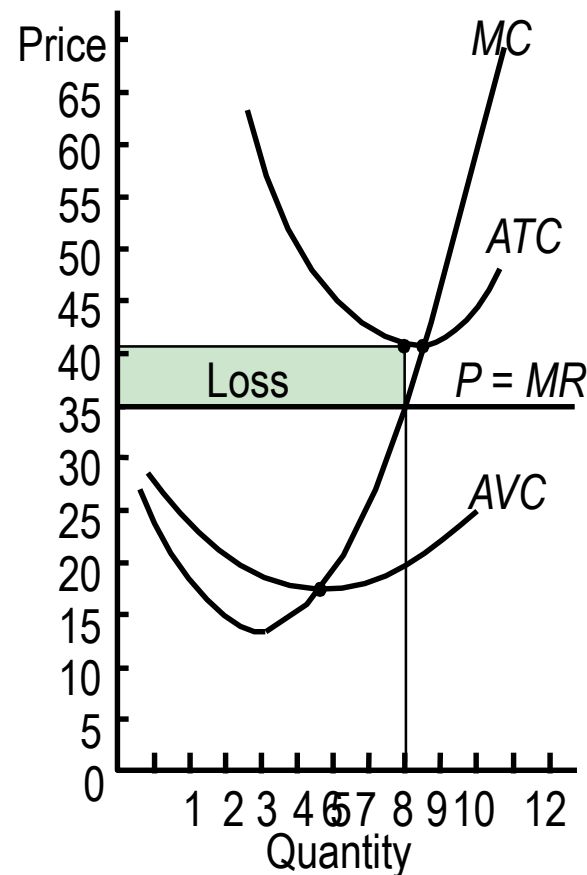
Short-run Equi^m; Output, Price & Profits of the Firm (Graphically)



(a) Profit case



(b) Zero profit case



(c) Loss case

Explanation

- In Short-run, the firms may get super-normal profit as presented in panel-1 or loss as presented in panel-3 or even no profit no loss as presented in panel-2 of the diagram in the previous slide. But in the Long-run, the firms will only have **normal profit** (no profit no loss).

Short-run Profit or Loss

- 1) If P exceeds AC , the firm is maximising total profits.
- 2) If P is less than AC but greater than AVC , the firm minimise total losses.
- 3) If P less than AVC , the firm minimises total losses by shutting down.

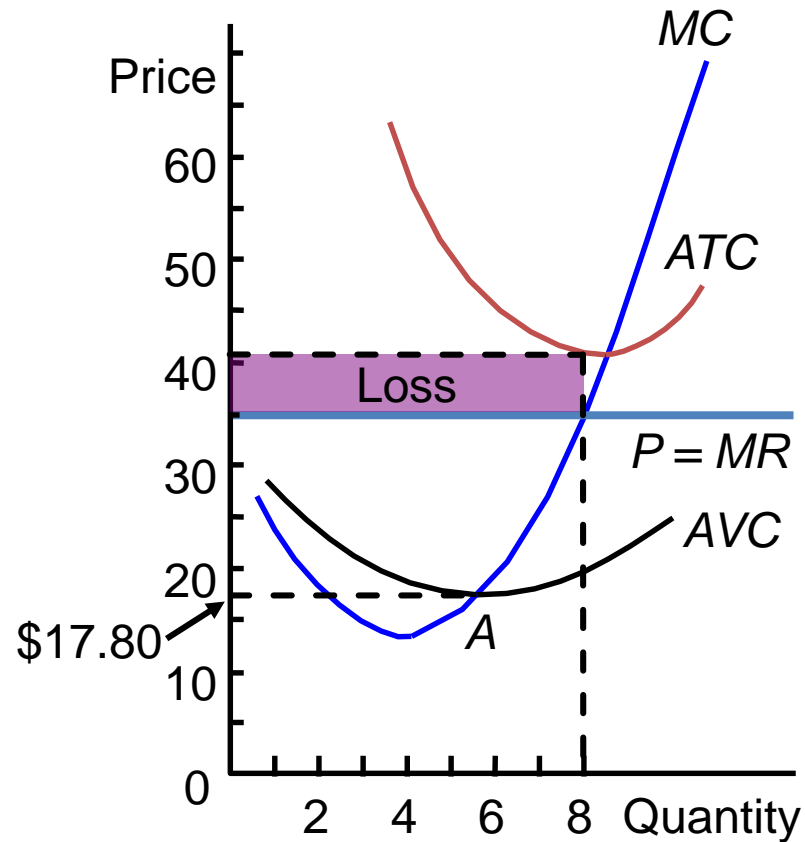
The Shutdown Point

The shut down point is the point where MC cuts AVC from it's minimum point , i.e., $P=AVC$ & losses equal to TFC (total fixed cost), where the firm produces or not. Thus, the **shutdown point** is the point at which the firm will gain more by shutting down than it will by staying in business.

The firm will shut-down if it can not cover the AVC .

- 1) A firm should continue to produce as long as P is greater than AVC
- 2) Once P falls below that point it makes sense to shut down temporarily & save the variable cost.

The Shutdown Decision



(1) Marginal Cost-Marginal Revenue Analysis:

During the short run, a firm will produce only if its price equals the average variable cost or is higher than the average variable cost (AVC).

1) Further, if the price is more than the averages total costs (SAC or ATC), i.e., $P = AR > SAC$, the firm will be earning ***supernormal (or abnormal) profits***.

2) If price equals the average total costs, i.e., $P = AR = SAC$, the firm will be earning ***normal (or zero) profits or breaks-even***. If price equals AVC, the firm will be incurring a loss.

3) If price falls even a little below AVC, the firm will ***shut down*** because in order to produce it must cover at least its AVC during the short-run.

So during the short-run under PCM, a firm is in equilibrium in all the above noted situations. We illustrate them diagrammatically as under-

Supernormal Profits:

The firm will be earning supernormal profits in the short-run when price is higher than the short-run average cost, as shown in Figure 2 (A). The firm is in equilibrium at point E_1 where $SMC=MR$ and SMC cuts MR from below. OQ_1 is the equilibrium output and $OP (=Q_1E_1)$ is the equilibrium price. Q_1S are the short-run average costs. $SE_1 (=Q_1E_1 - Q_1S)$ is the profit per unit. TS (equilibrium output) (per unit profit) = TSE_1P area is the supernormal profits.

Normal Profits:

The firm may earn normal profits when price equals the short-run average costs as shown in Figure 2 (B). The firm is in equilibrium at point E_2 where $SMC = MR$ and SMC cuts MR from below. OQ_2 is the equilibrium output and $OP (=Q_2E_2)$ is the equilibrium price. The firm is earning normal profits because $Price = AR = MR = SMC = SAC$ at its minimum point E_2 .

Minimum Loss:

The firm may be in equilibrium and yet incur a loss when price is less than the short-run average costs, as shown in Figure 2 (C). The firm is in equilibrium at point E_3 where $SMC = MR$ and SMC cuts MR from below. OQ_3 is the equilibrium output and OP ($=Q_3E_3$) is the equilibrium price.

Since the average costs Q_3B are higher than the price Q_3E_3 , E_3B is the loss per unit ($Q_3B - Q_3E_3$). The total loss is $PE_3 \times E_3B = PE_3BA$. The firm will continue to produce OQ_3 output so long as it is covering its average variable cost plus some of its fixed cost.

Maximum Loss:

If the price fig. 2 falls to the level of AVC , the firm will just cover its average variable cost, as shown in figure 2 (D). It is indifferent whether to operate or close down because its losses are the maximum.

It will pay such a firm to continue producing OQ_4 output and incur PE_4GF losses rather than close down in the short-run. OQ_4 is the shutdown output because if the price falls below OP , the firm will stop production. E_4 is, therefore, the shutdown point.

Shut Down Stage:

Figure 2. (E) shows a firm which is unable to cover even its AVC at OQ_0 level of output because the price OP is below the AVC curve. It must shut down.

Thus in the short-run, there are firms which earn normal profits, supernormal profits and incur losses.

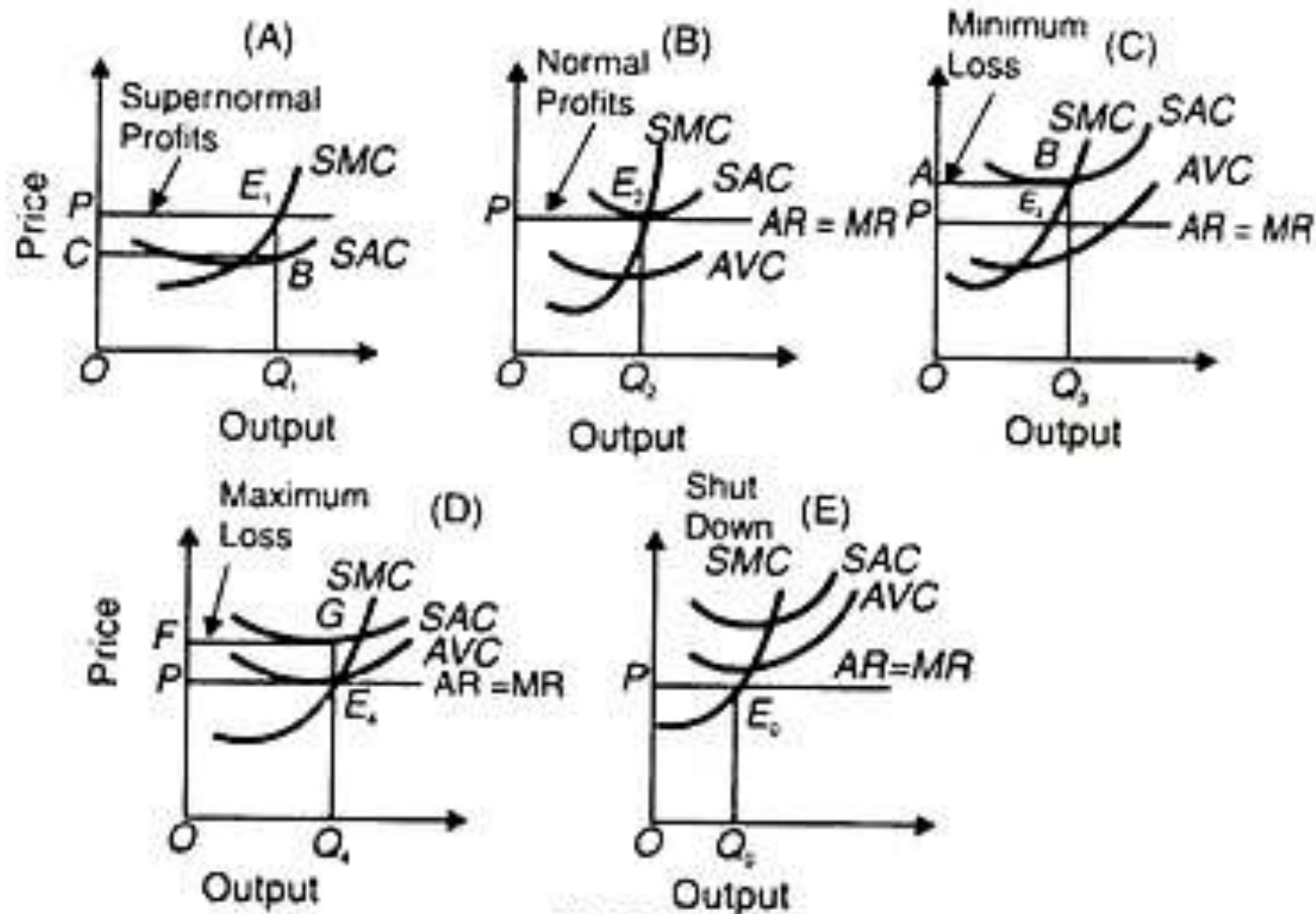


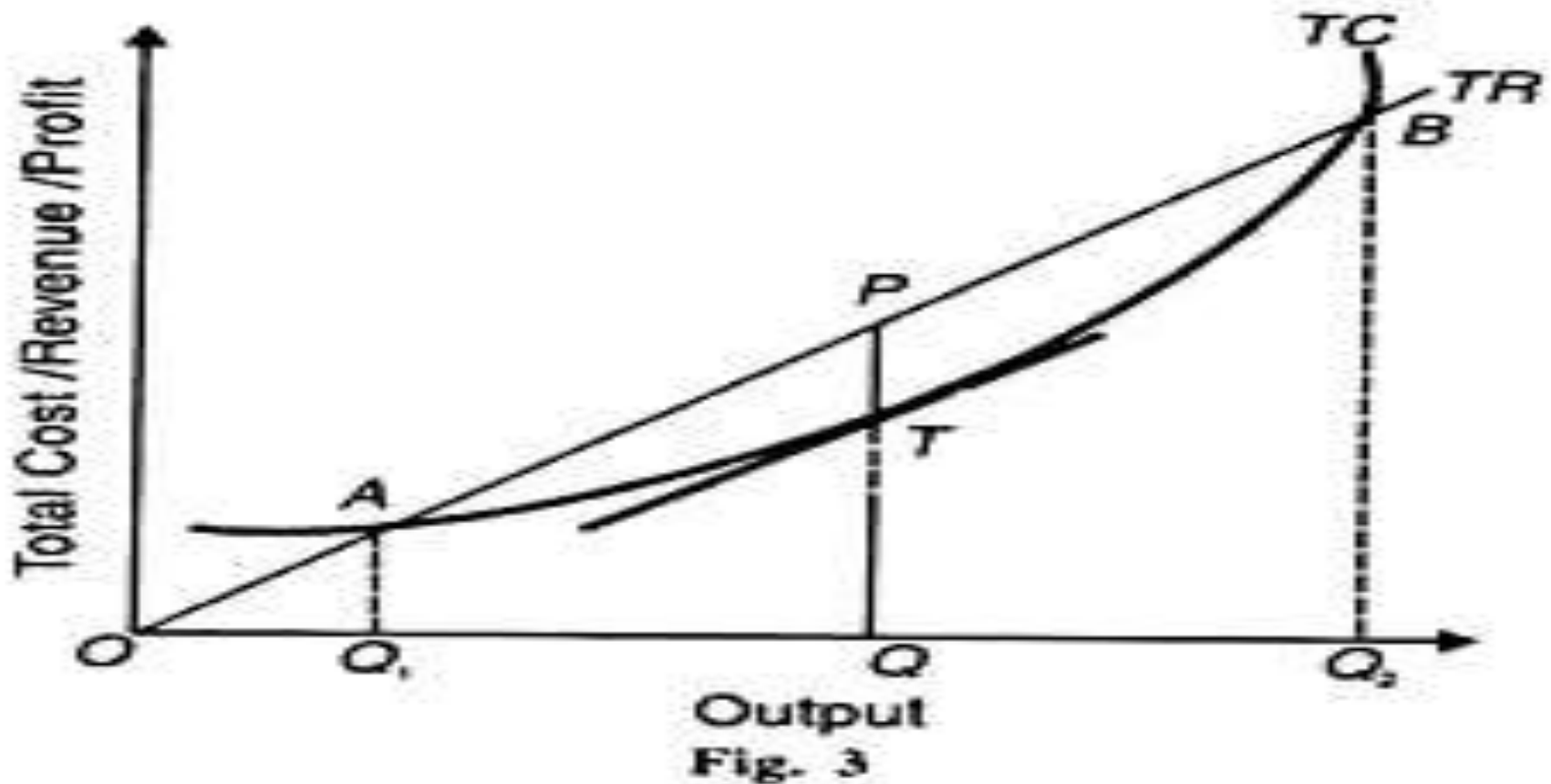
Fig. 2

(2) Total Cost-Total Revenue Analysis:

The short-run equilibrium of the firm can also be shown with the help of total cost and total revenue curves. **The firm is able to maximize its profits when the positive difference between TR and TC is the greatest.** This is shown in Figure 3 where TR is the total revenue curve and TC the total cost curve.

The total revenue curve is an upward sloping straight line curve starting from O. This is because the firm sells small or large quantities of its product at a constant price under PCM. **If the firm produces nothing, total revenue will be zero. The more it produces, the larger is the increase in total revenue.** Hence the TR curve is linear and slopes upward.

The firm will maximize its profits at that level of output where the gap between the TR curve and the TC curve is the maximum. **Geometrically, it is that level at which the slope of a tangent drawn to the total cost curve equals the slope of the total revenue curve.** In Figure 3, the maximum amount of profit is measured by TP at OQ output.



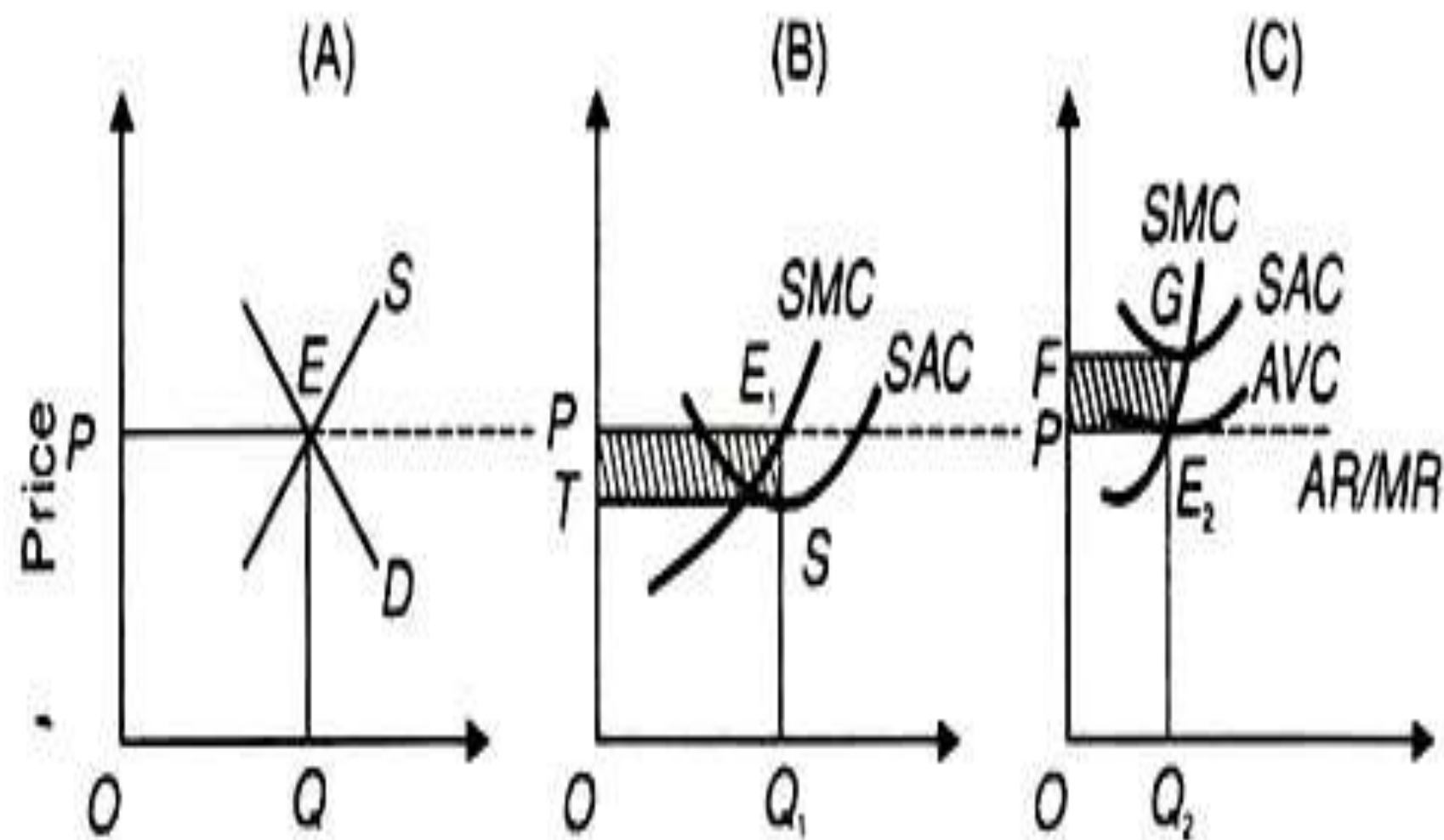
At outputs smaller or larger than OQ between A and B points, the firm's profits shrink. If the firm produces OQ_1 output, its losses are the maximum because the TC curve is above the TR curve. At Q_1 its profits are zero. This is the **break-even point** of the firm. It starts earning profits when it produces beyond OQ_1 output level. At OQ_2 level, its profits are again zero. If it produces beyond this level, it incurs losses because $TC > TR$.

Short-Run Equilibrium of the **Industry**:

An industry is in equilibrium in the short-run when its total output remains steady, there being no tendency to expand or contract its output. *If all firms are in equilibrium, the industry is also in equilibrium.* For full equilibrium of the industry in the short-run, all firms must be earning only normal profits.

The condition for this is $SMC = MR = AR = SAC$. But full equilibrium of the industry is by sheer accident because in the short-run some firms may be earning supernormal profits and some incurring losses. Even then, the industry is in short-run equilibrium when its quantity demanded and quantities supplied are equal at the price which clears the market.

This is illustrated in Figure 4 where in Panel (A), the industry is in equilibrium at point E where its demand curve D and supply curve S intersect which determine OP price at which its total output OQ is cleared. But at the prevailing price OP, some firms are earning supernormal profits PE_1ST , as shown in Panel (B), while some other firms are incurring FGE_2P losses, as shown in Panel (C) of the figure.



Output
Fig. 4

B) Long-Run Equilibrium of the Firm and Industry:

Long-Run Equilibrium of the Firm:

The long run is a period of time in which the firm can change its plant and scale of operations. Thus in the long-run all costs are variable and there are no fixed costs. The firm is in the long-run equilibrium under perfect competition when it does not want to change its equilibrium output.

It is earning normal profits. If some firms are earning supernormal profits, new firms will enter the industry and supernormal profits will be competed away. If some firms are incurring losses, some of the firms will leave the industry till all earn normal profits.

Thus there is no tendency for firms to enter or leave the industry because every firm must earn normal profits. **“In the long-run, firms are in equilibrium when they have adjusted their plant so as to produce at the minimum point of their long-run AC curve, which is tangent (at this point) to the demand (AR) curve defined by the market price”** so that they earn normal profits.

Assumptions:

This analysis is based on the following assumptions:

1. Firms are free to enter into or leave the industry.
2. All firms are of equal efficiency.
3. All factors are homogenous. They can be obtained at constant and uniform prices.

SMC

4. Cost curves of firms are uniform.
5. The plants of firms are equal, having given technology.
6. All firms have perfect knowledge about price and output.

Given these assumptions, each firm of the industry will be in equilibrium when it fulfils the following two conditions.

(1) In equilibrium, its short-run marginal cost (SMC) must equal to its long-run marginal cost (LMC) as well as its short-run average cost (SAC) and its long-run average cost (LAC) and both should equal $MR=AR=P$.

Thus the first equilibrium condition is:

$SMC = LMC = MR = AR = P = SAC = LAC$ at its minimum point, and

(2) LMC curve must cut MR curve from below: Both these conditions of equilibrium are satisfied at point E in Figure 5 where SMC and LMC curves cut from below SAC and LAC curves at their minimum point E and SMC and LMC curves cut $AR = MR$ curve from below. All curves meet at this point E and the firm produces OQ optimum output and sells it at OP price.

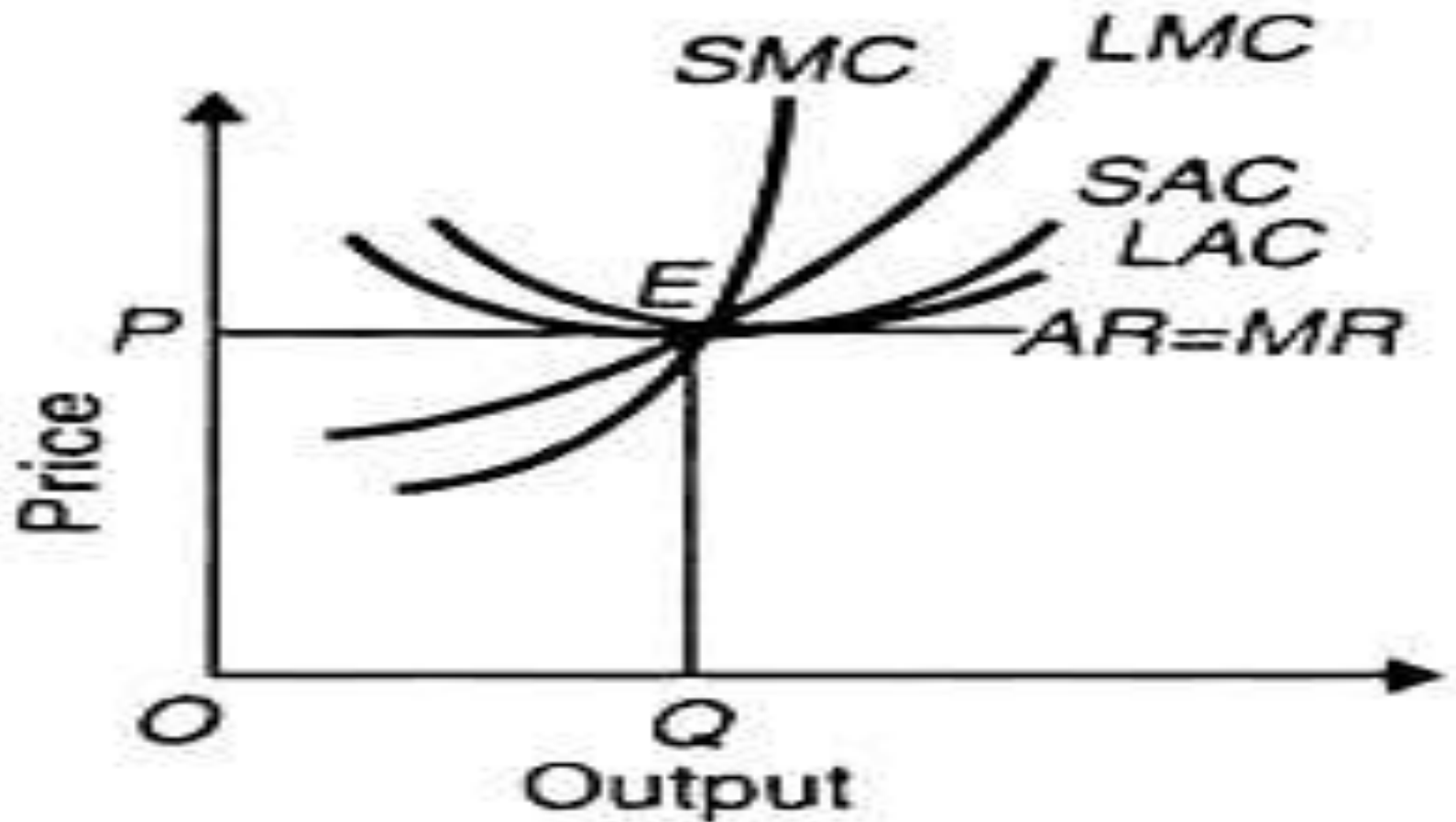


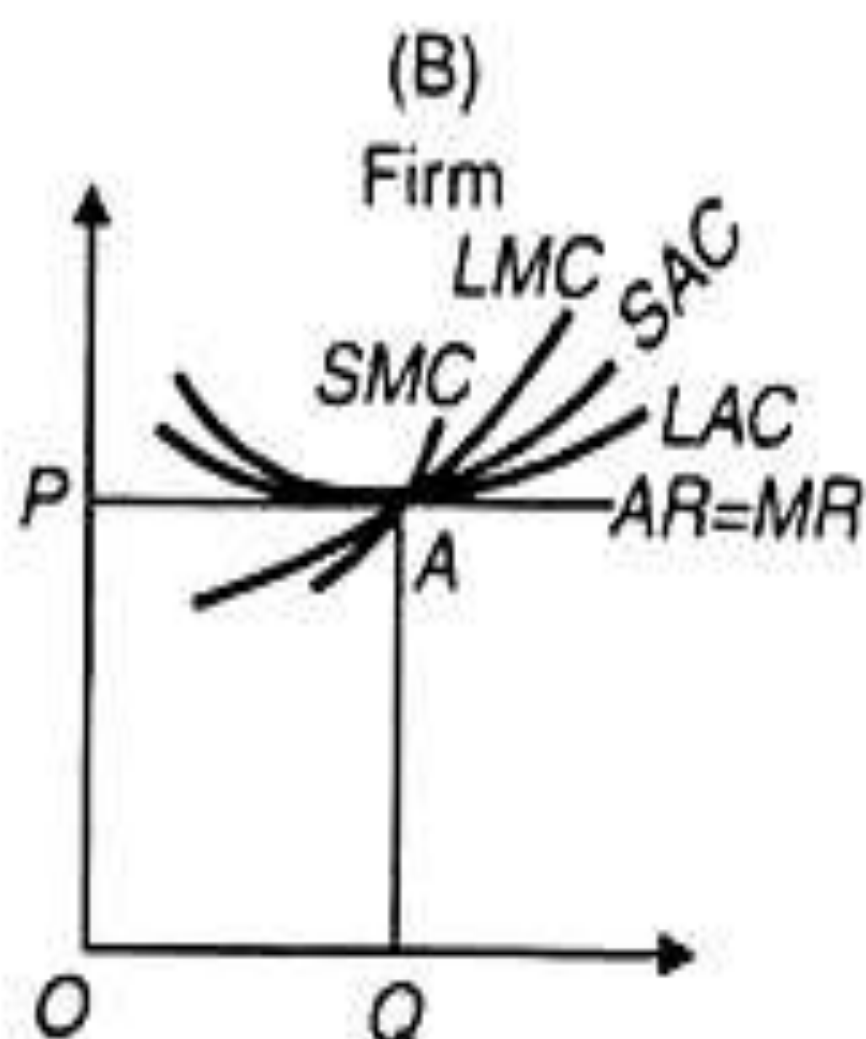
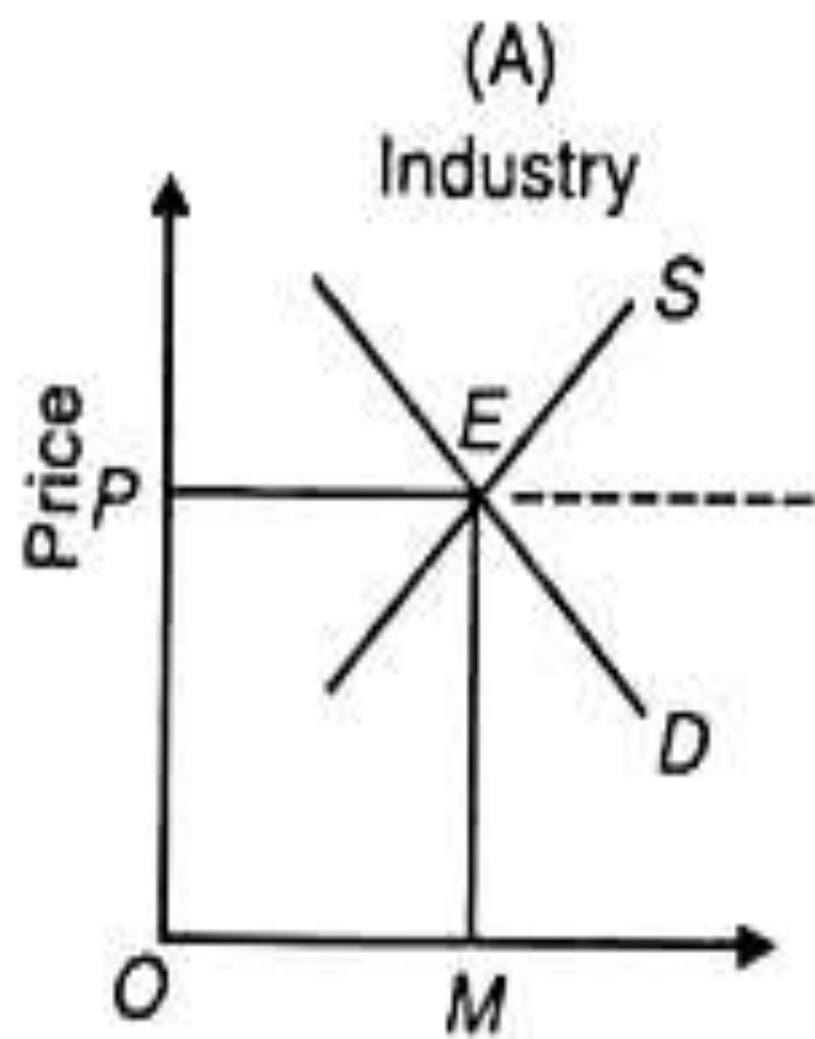
Fig. 5

Since we assume equal costs of all the firms of industry, all firms will be in equilibrium in the long-run. At OP price a firm will have neither a tendency to neither leave nor enter the industry and all firms will earn normal profits.

Long-Run Equilibrium of the Industry:

The industry is in equilibrium in the long-run when all firms earn normal profits. There is no incentive for firms to leave the industry or for new firms to enter it. With all factors homogeneous and given their prices and the same technology, each firm and industry as a whole are in full equilibrium where $LMC = MR = AR (-P) = LAC$ at its minimum.

Such an equilibrium position is attained when the long-run price for the industry is determined by the equality of total demand and supply of the industry.



Output
Fig. 6

The long-run equilibrium of the industry is illustrated in Figure 6 (A) where the long-run price OP is determined by the intersection of the demand curve D and the supply curve S at point E and the industry is producing OM output. At this price OP, the firms are in equilibrium at point A in Panel (B) at OQ level of output where-

$LMC = SMC = MR = P (= AR) = SAC = LAC$ at its minimum.

At this level, the firms are earning normal profits and have no incentive to enter or leave the industry. It follows that when the industry is in long-run equilibrium, each firm in the industry is also in long-run equilibrium. If both the industry and the firms are in long-run equilibrium, they are also in short-run equilibrium.

CHOOSING OUTPUT IN THE LONG RUN

Long-Run Competitive Equilibrium: Entry and Exit

In a market with entry and exit, a firm enters when it can earn a positive long-run profit and exits when it faces the prospect of a long-run loss.

- **long-run competitive equilibrium** All firms in an industry are maximizing profit, no firm has an incentive to enter or exit, and price is such that quantity supplied equals quantity demanded.

A long-run competitive equilibrium occurs when three conditions hold:

1. All firms in the industry are maximizing profit.
2. No firm has an incentive either to enter or exit the industry because all firms are earning only **normal profit**, i.e. $\pi = 0$ (As we know that $\pi = TR - TC$, but here the $TC = \text{Explicit cost} + \text{opportunity cost}$).
3. At the equilibrium quantity, ***if the average cost is equal to the average revenue, then the firm is earning a normal profit.***
4. The price of the product is such that the quantity supplied by the industry is equal to the quantity demanded by consumers.

Examples: Perfectly Competitive Firm

Example – 1: A perfectly competitive firm faces a price of Rs.12 per unit. It has the following short run cost schedule:

output	0	1	2	3	4	5	6	7	8
Total cost	10	18	24	30	38	50	64	91	120

- Find the marginal cost for each level of output
- Find the profit maximizing output
- How much profit is made at this output?
- How would the decision change if a lump-sum tax of Rs.12 is imposed?

Solution-1

a.

MC	8	6	6	8	12	14	25	29
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b. For profit maximization, $mc = mr$

So the producer will produce 5 units

c. At this level of output, the total cost = 50 and TR = 60

Thus profit = 10

d. A lump sum tax does not affect the marginal cost curve . Hence equilibrium remains unchanged in the short run. But in the long run , the economic profits will be negative. so some firms will move out of business and the new price will be such that there are no economic profits.

Example-2

Demand curve faced by a firm under perfect competition is

$$P = 250 - Q$$

Cost function of the said firm is

$$C = 100 + 50Q$$

What is the profit maximizing price and output for the firm?

Solution-2

Demand function

$$P = 250 - Q \text{ \& } TR = P.Q = 250Q - Q^2$$

$$\text{Then, } MR = 250 - 2Q$$

$$\text{Similarly, the Cost function is } TC = 100 + 50Q$$

$$\text{Then, } MC = 50$$

As we know, to maximize profit $MR = MC$

$$\text{Then, } 250 - 2Q = 50 \text{ \& } Q = 100$$

$$\text{Then } P = 250 - 100 = 150.$$

Q.3. Suppose the following demand & supply function of the commodity are given which is being produced under conditions of perfect competition, i.e. $Q_d = 750 - 25p$ & $Q_s = 300 + 20p$.

Find out the equilibrium P & Q?

Q.4. For a perfectly competitive firm, the following short-run function is given

$$TC = 2 + 4Q + Q^2$$

If Price of the product prevailing in the market is Rs 8, then at what level of output the firm will maximize profits (By using total & Marginal Approach)?

Thank You All

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