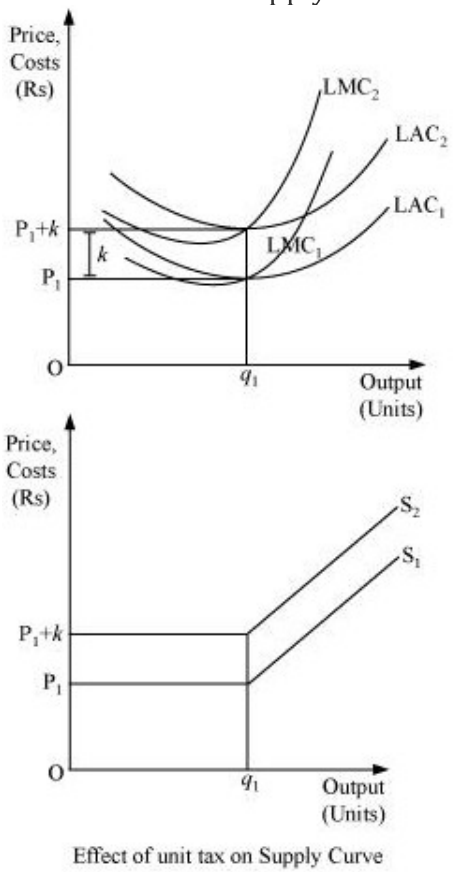
## Chapter-04 (Microeconomics) (Part – II)

## Theory of the Firm Under Perfect Competition

**Ans15:** A unit tax is the tax imposed on per unit of the output sold. Due to the imposition of unit tax, the cost of production per unit of output increases, which ultimately increases the marginal cost. Consequently, the LMC curve will shift leftward upward and as the supply curve is a portion of LMC, so the supply curve will also shift leftward upward.
Let us understand the effect of imposition of unit tax through an example.
Suppose that a firm is facing the price $OP_1$. $LAC_1$ and $LMC_1$ are the long run average cost curve and long run marginal cost curve respectively. Also assume that the government has imposed a unit tax of Rs *k* per unit of output produced. Now, this will rise the firm's LAC and LMC, as the firm needs to pay Rs *k* extra on each output produced. Consequently, $LMC_1$ and $LAC_1$ will shift leftward upwards to $LMC_2$ and $LAC_2$. The magnitude of shift is equal to Rs *k*. As the supply curve is a part of LMC, it will also shift leftward from $S_1$ to $S_2$ , due to the imposition of the tax. Consequently, the firm will now supply lesser units of output.




Effect of unit tax on Supply Curve

**Ans16:** An increase in the price of an input increases the cost of production, which in turn increases the marginal cost of the firm. Consequently, the MC curve will shift upward

to the left and the supply curve will also shift leftward upward. Therefore, an increase in the input price negatively affects the supply of the firm.

**Ans17:** The market supply curve is a horizontal summation of all the supply curves of individual firms in the market. If the number of firms in a market increases, then the market supply curve will shift rightward as there will be more number of firms supplying more amount of output.

**Ans18:** Price elasticity of supply $(e_s)$ is defined as the degree of the responsiveness of quantity supplied, to the change in the price of a good.
It is expressed as:

$$e_s = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100}$$

$$= \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Where,
$\Delta Q$ = change in quantity supplied
$\Delta P$ = change in price
P = initial price
Q = initial supply

**Ans19:**

| **Quantity Sold** | $TR = P \times Q$ | $MR = TR_n - TR_{n-1}$ | **AR = 10** |
|---|---|---|---|
| 0 | - | - | - |
| 1 | $10 \times 1 = 10$ | 10 - 0 = 10 | 10 |
| 2 | $10 \times 2 = 20$ | 20 -10 = 10 | 10 |
| 3 | $10 \times 3 = 30$ | 30 - 20 = 10 | 10 |
| 4 | $10 \times 4 = 40$ | 40 - 30 = 10 | 10 |
| 5 | $10 \times 5 = 50$ | 50 - 40 = 10 | 10 |
| 6 | $10 \times 6 = 60$ | 60 - 50 = 10 | 10 |

**Ans20:**

| **Quantity Sold** | **TR** | **TC** | **Profit** | $AR = \frac{TR}{Q}$ |
|---|---|---|---|---|
| 0 | 0 | 5 | 0 - 5 = -5 | - |

| | | | | |
|---|---|---|---|---|
| 1 | 5 | 7 | 5 - 7 = -2 | $\frac{5}{1}=5$ |
| 2 | 10 | 10 | 10 - 10 = 0 | $\frac{10}{2}=5$ |
| 3 | 15 | 12 | 15 - 12 = 3 | $\frac{15}{3}=5$ |
| 4 | 20 | 15 | 20 - 15 = 5 | $\frac{20}{4}=5$ |
| 5 | 25 | 23 | 25 - 23 = 2 | $\frac{25}{5}=5$ |
| 6 | 30 | 33 | 30 - 33 = 2 | $\frac{30}{6}=5$ |
| 7 | 35 | 40 | 35 - 40 = -5 | $\frac{35}{7}=5$ |

**Ans21:**

| **Quantity Sold** | **Price** | **TC** | $TR = P \times Q$ | **Profit = TR - TC** |
|---|---|---|---|---|
| 0 | 10 | 5 | $10\times0=0$ | 0 - 5 = -5 |
| 1 | 10 | 15 | $10\times1=10$ | 10 - 15 = -5 |
| 2 | 10 | 22 | $10\times2=20$ | 20 - 22 = -2 |
| 3 | 10 | 27 | $10\times3=30$ | 30 - 27 = 3 |
| 4 | 10 | 31 | $10\times4=40$ | 40 - 31 = 9 |
| 5 | 10 | 38 | $10\times5=50$ | 50 - 38 = 12 |
| 6 | 10 | 49 | $10\times6=60$ | 60 - 49 = 11 |
| 7 | 10 | 63 | $10\times7=70$ | 70 - 63 = 7 |
| 8 | 10 | 81 | $10\times8=80$ | 80 - 81 = -1 |
| 9 | 10 | 101 | $10\times9=90$ | 90 - 101 = -11 |
| 10 | 10 | 123 | $10\times10=100$ | 100 - 123 = -23 |

Profit maximising output is where the difference between *TR* and *TC* is the maximum. This exists at 5 units of output, where firm is earning profit of Rs 12.

**Ans22:**

| **Price** | $SS_1$ **(units)** | $SS_2$ **(units)** | **Market Supply =** $SS_1$ **+** $SS_2$ |
|---|---|---|---|
| 0 | 0 | 0 | 0 + 0 = 0 |
| 1 | 0 | 0 | 0 + 0 = 0 |
| 2 | 0 | 0 | 0 + 0 = 0 |
| 3 | 1 | 1 | 1 + 1 = 2 |
| 4 | 2 | 2 | 2 + 2 = 4 |
| 5 | 3 | 3 | 3 + 3 = 6 |

| | | | |
|---|---|---|---|
| 6 | 4 | 4 | 4 + 4 = 8 |

**Ans23:**

| **Price** | $SS_1$ **(kg)** | $SS_2$ **(kg)** | **Market Supply =** $SS_1 +$ $SS_2$ |
|---|---|---|---|
| 0 | 0 | 0 | 0 + 0 = 0 |
| 1 | 0 | 0 | 0 + 0 = 0 |
| 2 | 0 | 0 | 0 + 0 = 0 |
| 3 | 1 | 0 | 1 + 0 = 0 |
| 4 | 2 | 0.5 | 2 + 0.5 = 2.5 |
| 5 | 3 | 1 | 3 + 1 = 4 |
| 6 | 4 | 1.5 | 4 + 1.5 = 5.5 |
| 7 | 5 | 2 | 5 + 2 = 7 |
| 8 | 6 | 2.5 | 6 + 2.5 = 8.5 |

**Ans24:**

| **Price** | $SS_1$ **(units)** | $SS_2$ **(units)** | $SS_3$ **(units)** | **Market Supply =** $SS_1 + SS_2 +$ $SS_3$ | |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | |
| 1 | 0 | 0 | 0 | 0 | |
| 2 | 2 | 2 | 2 | 6 | |
| 3 | 4 | 4 | 4 | 12 | |
| 4 | 6 | 6 | 6 | 18 | |
| 5 | 8 | 8 | 8 | 24 | |
| 6 | 10 | 10 | 10 | 30 | |
| 7 | 12 | 12 | 12 | 36 | |
| 8 | 14 | 14 | 14 | 42 | |

**Ans25:** At Price, $P_1$ = Rs 10

Total Revenue, $TR_1 = P_1 \times Q_1 = 50$

$= \frac{TR_1}{P_1} = Q_1$

$= \frac{50}{10} = Q_1$

$= Q_1 = 5 \; units$

At Price, $P_2$ = Rs 15

Total Revenue, $TR_2 = P_2 \times Q_2 = 150$

$= Q_2 = \frac{TR_2}{P_2}$

$= Q_2 = \frac{150}{15}$

$= Q_2 = 10 units$

Elasticity of supply, $e_S = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

$\Delta Q = Q_2 - Q_1 = 10 - 5 = 5$

P = $P_1 - P_2 = 15 - 10 = 5$

$e_S = \frac{5}{5} \times \frac{10}{5}$

$e_S = 2$

**Ans26:** Elasticity of Supply, $e_S = 0.5$

Initial Price, $P_1$ = Rs 5

Final price, $P_2$ = Rs 20

$\Delta P = P_2 - P_1$

= 20 – 5

$\Delta P = 15$

$\Delta Q = 15$

$e_s = \frac{\Delta Q}{\Delta p} \times \frac{P_1}{Q_1}$

$0.5 = \frac{15}{15} \times \frac{5}{Q_1}$

$0.5 = \frac{5}{Q_1}$

$Q_1 = \frac{5}{0.5}$

=10 units

Initial quantity = 10 units

Final quantity, $Q_2 = \Delta Q + Q_1$

= 15 + 10

Therefore, $Q_2$ = 25 units

**Ans27:** Initial Price, $P_1$ = Rs 10

Initial Output, $Q_1$ = 4 units

Final Price, $P_2$ = Rs 30

$\Delta P = P_2 - P_1$

= Rs 30 - 10 = Rs 20

Elasticity of supply, $e_s$ = 1.25

$$e_s = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1}$$

$$1.25 = \frac{\Delta Q}{20} \times \frac{10}{4}$$

$$= 1.25 \times 8 = \Delta Q$$

$= \Delta Q$ = 10 units

Thus final output supplied, $Q_2 = \Delta Q + Q_1$

$Q_2$ = 10 + 4 = 14 units