HU301

DATE: / /
PAGE

① demand law : $q = 10 - p$; $q = 4$, $p = ₹6$

prize ↑ 5%. Determine % ↓ in Demand & hence an approximation to the elasticity of demand.

⇒ new price → 5% of initial price $p = 6$:

$$p_1 \Rightarrow 6 + \frac{5}{100} \times 6 \Rightarrow 6.3$$

New Demand → $q = 10 - p$

$$\Rightarrow q_1 = 10 - 6.3 = 3.7$$

% ↓ in demand ⇒

change in demand = $q - q_1 \Rightarrow 4 - 3.7$
$= 0.3$

$$\% \downarrow = \left(\frac{0.3}{4}\right) \times 100 \Rightarrow 7.5\%$$

Approximate elasticity of demand (E_d) = $\dfrac{\%\text{ change in demand}}{\%\text{ change in price}}$

$$= \frac{7.5}{5} \Rightarrow \underline{\underline{1.5}}\ \text{Ans}$$

② The price elasticity of demand for milk is equal to 1 & at price of ₹35/lit, a milk

DATE: ___
PAGE ___

Shop demand 70 lit of milk. If the price become ₹ 40/lit. how much milk shopkeeper would purchase if it doesn't intend to ↑ it's expenditure on milk.

=) Elasticity of demand $(E_d) = 1$

(p_0) Initial price = 35/lit

Initial Qty (q_0) = 70 lit

New price (p_1) = 40/lit.

Initial expenditure $= p_0 \times q_0 = 35 \times 70 = 2450$ ₹

Expenditure at new price $= q_1 \times p_1 =$ Initial expenditure

q_1 ↓ new qty.

$$q_1 = \frac{2450}{40} \Rightarrow 61.25$$

$\simeq$ 61 lit of milk Ans

③ If $e_d = 1$, 5 kg of grapes are demanded at ₹ 80/kg. At what price 6 kg of grapes will be demanded?

=) let new price = p

~~Ed~~

GOOD WRITE

DATE: ___/___/___
PAGE ___

$$E_d = -\left(\frac{\text{New demand} - \text{old demand}}{\text{New price} - \text{old price}} \times \frac{\text{old price}}{\text{old demand}}\right)$$

$$1 = -\left(\frac{6-5}{p-80} \times \frac{80}{5}\right)$$

$$p = 64$$

$\therefore$ at ₹ 64/kg, 6 kg grape will be demanded.

④ find price Elasticity E_d, if demand f^n $q = 25 - 4p + p^2$ where 'q' is demand for commodity at price 'p'.

$\Rightarrow$ marginal $f^n \Rightarrow \frac{dq}{dp} = 2p - 4$

$$\text{avg. } f^n = \frac{q}{p} = \frac{25 - 4p + p^2}{p}$$

$$|E_d| = \frac{\text{marginal } f^n}{\text{Avg } f^n} = \frac{(2p-4)\,p}{25 - 4p + p^2}$$

① at $p = 4$, then $|E_d| = \frac{(2(4) - 4)\,4}{25 - 4\times4 + (4)^2} = 0.64$

$\therefore$ at $p = 4$, demand is less than Elastic

② $p = 5$, $|E_d| = 1$

at $p = 5$, Elasticity of demand is unitary.

$\frac{20-x}{\frac{20}{(p+1)}}$) $\frac{(20-x)(p+1)}{20}$

④ $p = 8$;

$$|E_d| = \frac{(-4+16)8}{25-32+64} = 1.7$$

∴ > 1, so demand is said to be more than unit elastic i.e., $p=8$

⑤ If demand law is $x = \frac{20}{p+1}$, find E_d wrt price at point where $p=4$

⇒ $$|E_d| = -\frac{dx}{dp} \times \frac{p}{x} = -\frac{20}{(p+1)^2} \times \frac{p(p+1)}{20}$$

$$= \frac{-p}{p+1}$$

$p=4$; $E_d = \frac{-4}{5}$

⑥ The price of q_1 ↑ from ₹60 /kg to ₹75 /kg. As a result, demand for q_2 ↑ from 7kg to 10 kg. What is the cross elasticity of demand of q_1 & q_2.

⇒ Initial price of q_1 (P_1) = 60 /kg

New price of q_1 (P_2) = 75 /kg

Initial demand of q_2 (Q_1) = 7kg

$p+1 = \frac{20}{x}$

$p = \frac{20}{x} - 1$ $\quad p = \frac{20-x}{x}$ $\quad \frac{\frac{20-x}{x}}{x}$

$p = (20-x)$

New demand of q_2 (D_2) = 10kg.

Cross elasticity of Demand (E_c) $= \frac{\% \Delta Q_2}{\% \Delta P_1}$

$\% \Delta Q_2 = \frac{D_2 - D_1}{D_1} \times 100$ } % change in demand for q_2

$\% \Delta P_1 = \frac{P_2 - P_1}{P_1} \times 100$ } % change in price for q_1

$\Rightarrow \% \Delta Q_2 = \frac{10-7}{7} \times 100 \Rightarrow 42.85$

$\% \Delta P_1 = \frac{75-60}{60} \times 100 = 25\%$

$E_c = \frac{42.86}{25} \Rightarrow 1.71$

(7) Given Demand & total cost fn of perfect competitive firm as!

$p = 32 - q$

$TC = q^2 + 8q + 4$

what level of output will maximize total profit. what are the corresponding values of price (p), profit (p), & total revenue (TR).

$\Rightarrow$ Demand fn $(p) = 32 - q$

~~Total~~ Total cost fn (TC) $= q^2 + 8q + 4$

Total Revenue

$TR \Rightarrow p \times q = (32 - q)\, q = 32q - q^2$

Profit f^n $(\pi) = TR - TC$

$= 32q - q^2 - (q^2 + 8q + 4)$

$= 32q - q^2 - q^2 - 8q - 4$

$\Rightarrow 24q - 2q^2 - 4$

$\frac{d\pi}{dq} = 24 - 4q = 0$

$4q = 24$ $\boxed{q = 6}$

Price $(p) \Rightarrow p = 32 - q$

$= 32 - 6 \Rightarrow 26$

$TR \Rightarrow 32q - q^2 = 32(6) - (6)^2$

$= 156$

$TC \Rightarrow q^2 + 8q + 4 \Rightarrow 36 + 48 + 4$

$\Rightarrow 88.$

Profit $(\pi) \Rightarrow 24(6) - 2(6)^2 - 4$

$\Rightarrow 144 - 72 - 4 \Rightarrow 68$

(8) Consider a monopolist who faces a linear demand f^n, $p = 80 - 6q$ & also has a linear Total cost f^n, $TC = 50 + 20q$. What will be the eq^m level of output, price & profit. Also prove the second order condition for profit maximization.

=) demand f^n => $p = 80 - 6q$

$TC = 50 + 20q$

(TR) Total revenue = $p \times q = (80 - 6q)q = 80q - 6q^2$

$\pi = TR - TC \Rightarrow 80q - 6q^2 - 50 - 20q$

$\Rightarrow 60q - 6q^2 - 50$

First-order Condition for profit maximization :

$$\left[d\pi/dq = 0 \right]$$

$\Rightarrow$ $d\pi/dq = -12q + 60$

$$\boxed{q = 5}$$

$$\frac{d^2\pi}{dq^2} = -12 \quad (\therefore \text{max}^m \text{ at } q = 5)$$

Now, Price, TR & Profit at $q=5$:

(1) $p = 80 - 6q \Rightarrow 80 - 30 \Rightarrow 50$

(2) $TR = 80 \times 5 - 6(5)^2 \Rightarrow 400 - 150 \Rightarrow 250$

(3) $TC \Rightarrow 50 + 20(5) \Rightarrow 150$

(4) $\pi = 100$

(7) 1000 quintals of marble is req. for flooring in a building located in Delhi. The contractor has two options. The cost details for both are as under

S.no	Particular	Nearby shop	Outside shop
1	Distance	4 km	100 km
2	Transportation cost	700/km/quintal	700/km/quintal
3	Material cost	8150/quintal	5200/quintal

Quality is same. Which options will be more profitable? What will be the economic advantage?

⇒

S.no	Detail	Nearby shop	Outside
1	Total Material cost = Material cost/quintal × Total Material	8150 × 1000 ⇒ 8,150,000	5200 × 1000 ⇒ 5200,000
2	Total Transportation cost = Transportation cost/km/quintal × Distance × Total Amt. Transported	4 × 700 × 1000 ⇒ 28,00,000	100 × 700 × 1000 ⇒ 700,00,000

Total cost = Total Material cost + Total Transportation cost.

∴ Nearby Shop : 8,50,000 + 28,00,000
= 1,09,50,000

Outside = 52,00,000 + 7,00,00,000
= 7,52,00,000.

∴ first option is economical

Eco. adv = ₹ 7,52,00,000 − ₹1095 0000
= ₹ 6425 0000/- Ans

(10) Almirah making : 2-options.

Galvanised Iron : Aluminium :

Cost → ~~Rs~~ 70/m² → 90/m²

cost of finishing → 5000 → 6050
& bending

→ Size of sheet req : 60 m²

If Al used as raw material, joined by rivets = ₹ 1250
cost

for Galvanised Iron cost = 1700
(Spot welding used)

Transportation cost for each extra km = ₹ 850

Almirah made by Galvanised Iron weighs 2kg heavier than Aluminium almirah. Find better option.

=)

	Al	Fe
① Cost of sheet/m²	90	70
② Cost of req. sheet = Cost of Al sheet × total size of sheet req.	90×60 = 5400 ₹	70×60 =) 4200 ₹
③ Cost of making = finishing & bending + Rivet/spot welding	6050 + 1250 =) 7300 ₹	5000 + 1700 =) 6700 ₹
④ Additional Transportation cost = Additional Transportation cost/kg × Additional wt.	–	850×2 = 1700
Total	₹ ~~18~~ 12,700	₹ 12,600

∴ Galvanised is more economical.

Economic adv =) 12700 − 12600

= 100 ₹

⑪ In the design of pipes for transportation of crude oil to the underground storage site for distribution, the designer is considering two options, either PVC or RCC pipe. Because of remote location of oilfields, have to be bought from a dist. of 1000 km.

Particular	PVC	RCC
Qty. req.	200m	200m
Cost /m/ length	₹ 800	₹ 950
Transportation	7/kg /50Km	10/kg /50Km
weight /m	7kg	10kg

What material to be considered? What is eco. adv of the selection?

=) ① PVC:

a) ~~tot~~ weight = weight /m × Qty. req
= 7 × 200 = 1400 kg

b) Cost of transportation to oil field = Transportation Cost / m /50km × Dist.

$= 7 \times \frac{100\cancel{0}}{5\cancel{0}} = 140$ ₹

c) cost of pipe = cost/m × Qty. req = 800 × 200
=) ₹160000

d) cost of Transportation = b × wt
= 140 × 1400 = ₹196000

Total → 3,56,000

② RCC:

~~a) wt = weight /m × Qty. req.~~
~~=) 10 × 200 = 2000 kg~~

~~b) cost of Transportation~~ to oil field = ~~Transportation cost /m / 50 km~~ × Dist

$= 10 \times \frac{1000}{5\cancel{0}}$ =) ₹ 200

c) Cost of pipe = cost /m × qty. req

⇒ 950 × 200

⇒ 190000

d) cost of Transporting the pipe = b × wt.

⇒ 200 × ~~10~~ 2000

= ~~2000~~ 4,00,000

Total → 5,90,000

∴ PVC is advisable

Eco Adv. = 5,90,000 - 3,56,000

⇒ 2,34,000 A

(12) Lathe operating cost = ₹ 1100/hr

Grinder operating cost = ₹ 950/hr

Prodn req = 10,000 units / year

Time req. / 100 units:

① Design-A:

Lathe Time : 20 hrs / 100 units

Grinder Time : 8.5 hrs / 100 units

② Design-B:

Lathe Time : 16 hrs / 100 units

Grinder Time = 12 hrs / 100 units

⇒ ① Cal. Total Time req for 10,000 units :

no. of 100 unit batches = $\frac{10,000}{100}$ ⇒ 100 batches

② Cal. Total cost for each design :

a) Design - A :

Lathe Time = 20 hrs / batch × 100 batch = 2000 hrs.

Grinder Time = 8.5 hrs/batch × 100 batch ⇒ 850 hrs.

Lathe cost = 2000 hrs × 1100 ₹/hr = ₹ 22,00,000

Grinder cost = 850 hrs × 950 ₹/hr = ₹ 8,07,500

Total ⇒ 22,00,000 + 8,07,500 = ₹30,07,500

b) Design - B :

Lathe Time = 16 hrs / batch × 100 batch = 1600 hrs.

Grinder Time = 12 hrs / batch × 100 batch = 1200 hrs.

Lathe cost = 1600 hrs × 1100 ₹/hr = 17,60,000 ₹

Grind cost = 1200 hrs × 950 ₹ / hr = 29,00,000 ₹

Total = 29,00,000 ₹

DATE: __/__/__
PAGE ____

∴ 'B' is advisable

Eco. adv = 30,07,500 - 29,00,000
⇒ ₹ 1,07,500

(13) Sales = ₹ 1,00,000
Fixed cost = ₹ 40,000
Variable cost = ~~40,000~~ 45000

Find : (1) Contribution (2) profit (3) P/V ratio

(iv) BEP (v) MS.

(1) Contribution = Sales - Variable cost
= 100000 - 45000
= 55000

(2) Profit = Contribution - Fixed cost
= 55000 - 40000
= 15000

(3) Profit - Volume Ratio (P/V)

$$P/V = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$\Rightarrow \frac{55\cancel{000}}{1\cancel{00000}} \times 1\cancel{00} = 55\%$$

(4) Break - Even pt. (BEP) -

$$= \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{40,000}{0.55} = ₹\ 72,727.27$$

(5) Margin of Safety (MS) -

$$MS = Sales - BEP$$
$$= 100000 - 72727.27$$
$$= ₹ 27272.73$$

(14) Computer hardware comp. purchase computer screen at a cost ₹ 4500 each. In case the company make it, the fixed and variable cost would be ₹ 40,00,000 & ₹ 2000/screen respectively. Should the manufacturer make or buy the screen, if the annual demand is of 1500 computers?

=) ~~Selling price~~ =

Purchase = 4500/unit
Fixed cost = ₹ 40,00,000
Variable cost = ₹ 2000/unit

$$BEP = \frac{40,00,000}{4500 - 2000} = ₹ 1600$$

(15) A company produces Tyres. Cost of machine is ₹ 26,10,000. Cost of labour & raw material is ₹ 860 / tyre & ₹ 1400/tyre respectively. Manufacturer sells @ ₹ 4500 / ~~type~~. Tyre. What will be the break even point of company?

=) Fixed cost = 26,10,000

Variable cost /unit = Labour cost / ~~type~~ tyre + raw mat cost/tyre

= 860 + 1400 =) 2260 / tyre

Selling price / unit = 4500 / tyre.

$$BEP = \frac{2610000}{4500 - 2260} = \frac{2610000}{2240} = \underline{\underline{1165.18}}$$