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Q.#4.22 Date: 13/4/2020

(a) To maximize profit under price Discrimination:-

D.f. of Domestic Market: $Q_1 = 21 - 0.1P_1$

$$0.1P_1 = 21 - Q_1$$

$$P_1 = \frac{21}{0.1} - \frac{1}{0.1}Q_1$$

$$P_1 = 210 - 10Q_1 \quad \text{——— (i)}$$

For $TR_1 = P_1 \times Q_1$

$$= (210 - 10Q_1)Q_1$$

$$TR_1 = 210Q_1 - 10Q_1^2$$

now $MR_1 = \frac{dTR_1}{dQ_1} = \frac{d}{dQ_1}(210Q_1 - 10Q_1^2)$

$$MR_1 = 210 - 20Q_1$$

& $MC = \frac{dTC}{dQ} = \frac{d}{dQ}(2000 + 10Q)$

$$MC = 10$$

Domestic firm will maximize profit where $MR_1 = MC$

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$$210 - 20Q_1 = 10$$

$$210 - 10 = 20Q_1$$

$$200 = 20Q_1 \Rightarrow Q_1 = \frac{200}{20} = 10$$

$Q_1 = 10$, Put in (1) $P_1 = 210 - 10 \times 10$

$$P_1 = 210 - 100 = 110$$

Now D.f of foreign Market is

$$Q_2 = 50 - 0.4P_2$$

$$0.4P_2 = 50 - Q_2$$

$$P_2 = \frac{50}{0.4} - \frac{1}{0.4}Q_2$$

$$P_2 = 125 - 2.5Q_2 \quad \text{---------- (2)}$$

For $TR_2 = P_2Q_2$

$$= (125 - 2.5Q_2)Q_2$$

$$TR_2 = 125Q_2 - 2.5Q_2^2$$

now. $MR_2 = \frac{dTR_2}{dQ_2} = \frac{d}{dQ_2}(125Q_2 - 2.5Q_2^2)$

$$MR_2 = 125 - 5Q_2$$

In Foreign Market, firm will maximize profit where $MR_2 = MC$

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$125 - 5Q_2 = 10$

$125 - 10 = 5Q_2 \Rightarrow 115 = 5Q_2$

$Q_2 = 115/5 = 23$

$Q_2 = 23$, Put in (2)

$P_2 = 125 - 2.5(23) = 67.5$

D.M

$P_1 = 110$

$Q_1 = 10$

F.M

$P_2 = 67.5$

$Q_2 = 23$

(b) If the producer does not discriminate, $P_1 = P_2 = P$ and the Two demand functions can be combined as follows.

$Q = Q_1 + Q_2$

$Q = 21 - 0.1P + 50 - 0.4P$

$Q = 71 - 0.5P$

$0.5P = 71 - Q$

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$$P = \frac{71}{0.5} - \frac{1}{0.5}Q$$

$$P = 142 - 2Q. \quad \text{——— (3)}$$

Thus $TR = P \times Q = (142 - 2Q)Q$

$$TR = 142Q - 2Q^2.$$

$$MR = \frac{dTR}{dQ} = \frac{d}{dQ}(142Q - 2Q^2)$$

$$MR = 142 - 4Q.$$

Firm will maximize profit where

$$MR = MC$$

$$142 - 4Q = 10$$

$$142 - 10 = 4Q \Rightarrow 132 = 4Q.$$

$$Q = 33. \text{ Put in (3)}$$

$$P = 142 - 2(33)$$

$$P = 142 - 66 = 76$$

$$\boxed{P = 76, \quad Q = 33}$$

$$\boxed{\begin{array}{l} Q_1 = 10 \\ Q_2 = 23 \\ \hline Q = 33 \end{array}}$$

(c) With Discrimination :-

$TR = TR_1 + TR_2$

$= P_1Q_1 + P_2Q_2$

$TR = 110 \times 10 + 67.5 \times 23 = 2652.50$

$TC = 2000 + 10Q$ where $Q = Q_1 + Q_2$

$TC = 2000 + 10(Q_1 + Q_2)$

$= 2000 + 10(10 + 23)$

$TC = 2000 + 330 = 2330$

Now $\Pi = TR - TC$

Thus $\Pi = 2652.50 - 2330 = 322.50$

$\boxed{\Pi = 322.50}$

Without Discrimination :-

$TR = P \times Q$

$TR = 76 \times 33 = 2508$

& $TC = 2330$

$\Pi = TR - TC = 2508 - 2330$

$\boxed{\Pi = 178}$

Profit is higher with Disc. than without Disc.