1. Determine the revenue maximizing price and quantity by assuming the demand function $P = 10000 - 4Q$

Solution: Total revenue (TR) $= P.Q$

$$= (10000 - 4Q)Q$$

$$= 10000Q - 4Q^2$$

According to first order condition and set it equal to zero to maximize the ~~total~~ revenue.

$$\frac{dTR}{dQ} = 0$$

$$\Rightarrow 10000 - 8Q = 0$$

$$\Rightarrow -8Q = -10000$$

$$\Rightarrow Q = 1250$$

Substituting the value of Q into demand function.

$$P = 10000 - 4(1250)$$

$$= 5000$$

So, revenue maximizing price is 5000 Tk.

and " " quantity 1250 unit.

So, $TR = P.Q$

$$= 5000(1250)$$

$$= 6250000$$

Ex. 2 : In a perfect competition market, total cost is $C(Q) = Q^3 - 45Q^2 + 1000Q + 800$.
Find the amount of maximum profit, assuming price $P = 1000$ TK.

Solution:

we know, $TR = P \cdot Q$

$= 1000 \cdot Q$

$= 1000Q$

$$MR = \frac{dTR}{dQ} = 1000$$

first order condition of $MR = \frac{dMR}{dQ} = 0$

Given, $TC(Q) = Q^3 - 45Q^2 + 1000Q + 800$

According to first order condition,

$$\frac{dTC}{dQ} = 3Q^2 - 90Q + 1000$$

$\Rightarrow MC = 3Q^2 - 90Q + 1000$

First order condition of MC

$$\frac{dMC}{dQ} = 6Q - 90$$

For profit maximization,

$MC = MR$

$\Rightarrow 3Q^2 - 90Q + 1000 = 1000$

$\Rightarrow 3Q^2 - 90Q = 0$

$\Rightarrow 3Q(Q - 30) = 0$

$\Rightarrow Q - 30 = 0$

$\Rightarrow Q = 30$ or, $3Q = 0$

$\Rightarrow Q = 0/3 = 0$

(Note : For estimating, maximum profit, this conditions must be fulfilled : differentiation of MR < differention of MC.
(that means, slope of MR < slope of MC)

Now, when, $Q = 30$,

$$TR = P \cdot Q$$
$$= 1000 \times 30$$
$$= 30000$$

then, $TC = 30^3 - (45 \times 30)^2 + (1000 \times 30) + 800$

$$= 27000 - 40500 + 30000 + 800$$
$$= 17300$$

So, $\pi = TR - TC$

$$= 30000 - 17300$$
$$= 12700 \text{ TK. Ans.}$$