

## Answer on Question # 76031- Economics- Microeconomics:

**Question:** The Public Service Company of the Southwest is regulated by an elected state utility commission. The firm has total assets of \$500,000. The demand function for its services has been estimated as

$$P = \$250 - \$0.15Q$$

The firm faces the following total cost function:

$$TC = \$25,000 + \$10Q$$

(The total cost function does not include the firm's cost of capital.)

- In an unregulated environment, what price would this firm charge, what output would be produced, what would total profits be, and what rate of return would the firm earn on its asset base?
- The firm has proposed charging a price of \$100 for each unit of output. If this price is charged, what will be the total profits and the rate of return earned on the firm's asset base?
- The commission has ordered the firm to charge a price that will provide the firm with no more than a 10 percent return on its assets. What price should the firm charge, what output will be produced, and what dollar level of profits will be earned?

**Solution:** a. Conditions of equilibrium of a competitive firm in an unregulated environment would be:  $MR = MC$ .

$$\text{Demand function is } P = \$250 - \$0.15Q \text{ .....(1)}$$

$$MR = TR = (\$250 - \$0.15Q) \times Q \text{ .....(2)}$$

$$MC = TC = \$25,000 + \$10Q \text{ .....(3)}$$

Taking derivative of equation (2) we get,  $\$250 - \$0.3Q$

Again taking derivative of equation (3) we get,  $\$10$

$$\text{Now, } \$250 - \$0.3Q = \$10$$

$$\text{Or, } Q = 800$$

Now, plug  $Q = 800$  in equation (1) we get,

$$P = \$130$$

$$\text{Total profit} = P \times Q = \$130 \times 800 = \$104,000$$

We know ,return on asset (ROA) =  $\frac{\text{Total profit}}{\text{Total asset}} = \frac{\$104000}{\$500000} = 0.208 = 20.8 \%$

b. If charging price is \$100, then total profit is  
 $\$100 \times 800 = \$80000$

Now , return on asset will be  $\frac{\$80000}{\$500000} = 0.16 = 16 \%$

c. At a return of 10 % on its asset, we will need a profit:  $0.1 \times \$500,000 = \$50,000$

Now , Total profit = Total revenue – Total cost

So,  $50,000 = 250Q - 0.15Q^2 - 25000 - 10Q$

Or,  $-0.15Q^2 + 240Q - 75000 = 0$  .....(4)

Solving equation (4) we get,

$Q = 1174$  (approx.) or, 426

But acceptable value is 426.

Now plug the value of  $Q = 426$  in equation (1), we get, \$186.

**Answer:** a. Total output produced 800 units .

Price charge by the firm \$130.

Total profit = \$104000.

Rate of return earn by the firm is 20.8 %.

b. Total profit is \$80000.

Rate of return earn by the firm is 16 %.

c. Firm charged the price is \$186.

Total output produced is 426 units.

Total profit is \$50,000.

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