

Paper 4.1, Business Maths for B.Com (H) 2nd Year, Semester 4

Question Bank

1.

Using calculus, show that:

$$MR = AR (1 - 1/e)$$

If the demand law is $X = ae^{-bp}$, express demand elasticity and total, average and marginal revenue as functions of X . At what output is total revenue a maximum?

2.

For a firm

$$TC = x^2/25 + 3x + 100$$

And the demand function is

$$x = 75 - 3p.$$

If the tax rate is t per unit, find tax rate ' t ' that maximizes the tax revenue. What is the maximum tax revenue?

3.

The demand function and the total cost function of a monopolist are as follows:

$$p = 100 - 3q + 4A^{1/2} \quad \text{and} \quad C = 4q^2 + 10q + A$$

where A is the level of advertisement expenditure.

Find the values of A , p , and q to maximize profit.

4.

A firm requires 10,000 units of a product per year. The purchase price is Rs 2 per unit and the cost of replenishing the stock is Rs 40 per order regardless of the size of the order. If the annual carrying cost is 10% of the average inventory value, find the most economic order size.

5.

A monopolist charges different prices in the two markets where his demand functions are $x_1 = 21 - 0.1 p_1$ and

$x_2 = 50 - 0.4 p_2$, where p_1 and p_2 being prices and x_1 and x_2 quantities demanded. His total cost function is

$TC = 10x + 2000$, where x is total output. Find the prices that the monopolist should charge to maximize his profit. Also, verify that higher price will be charged in the market having the lower price elasticity of demand.

6.

If the demand laws for two commodities are given by:

$$x_1 = p_1^{-a} e^{a p_2 + a} \quad x_2 = p_2^{-a} e^{a p_1 + a}$$

Find the conditions that these commodities are:

- i. Competitive
- ii. Complementary

Also show that direct price elasticity of demand is independent of prices while the cross price elasticities depend upon the price of one commodity.

7.

In a linear programming what is a 'Feasible Solution' and 'Infeasible Solution'. Solve the following by graphic method and comment on the result.

$$\begin{aligned} \text{Minimise : } z &= 3x_1 + 2x_2 \\ \text{Subject to : } -2x_1 + 3x_2 &\leq 9 \\ 3x_1 - 2x_2 &\leq -20 \\ x_1, x_2 &\geq 0 \end{aligned}$$

8.

Show graphically a situation where a LP problem:

- i. Has no solution.
- ii. Has unbounded solution.
- iii. Has multiple optimal solution.

9.

A hypothetical economy produces only two commodities X and Y. The two commodities serve as intermediate inputs in each other's production. To produce a unit of X, 0.6 unit of X and 0.1 unit of Y are needed. Similarly, to produce a unit of Y, 0.7 unit of X and 0.4 unit of Y are needed. Two and five labour days are required to produce a unit of X and Y respectively. The wage rate is Rs 70 per man-day. The economy needs 100 units of X and 50 units of Y for final consumption.

You are required to:

- i. Examine the viability of input-output system using Hawkin's-Simon conditions;
- ii. Calculate the gross output of each of the two commodities in tons;
- iii. Determine the equilibrium prices, and;
- iv. Find the total value added.

10.

Solve the following linear programming problem using Simplex method:

$$\begin{aligned} \text{Maximize } z &= 10x + 12y \\ \text{Subject to : } x + y &= 5 \\ x &\geq 2 \\ y &\leq 4 \\ x, y &\geq 0 \end{aligned}$$