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Sl. No. : 486-A G

Unique Paper Code : 241385

Name of the Paper : Business Mathematics (Part-A)

Name of the Course : B.Com (Programme)

Semester : III

Maximum Marks: 25

Duration : 1 Hour

All questions are compulsory. Use separate answer sheets for Part-A and Part-B. Use of simple calculator is allowed. Log table and graph shall be provided on demand.

Q1. (a) A firm produces three products X_1, X_2 and X_3 requiring mix of three materials M_1, M_2 M_3. The per unit requirement for each product of different materials is as follows:

$$A = \begin{array}{c} \\ X_1 \\ X_2 \\ X_3 \end{array} \begin{array}{|ccc|} M_1 & M_2 & M_3 \\ 1 & 2 & 3 \\ 3 & 2 & 4 \\ 2 & 4 & 2 \end{array}$$

Using matrix notations, find;

(i) Total requirements of each material if the firm produces 40, 100 and 50 units of the products X_1, X_2 and X_3 respectively,

(ii) Per unit cost of production of each product if the per unit costs of materials M_1, M_2 and M_3 are Rs.10, Rs.15 and Rs. 20 respectively,

(iii) Per unit profit earned by each product if the selling price of X_1, X_2 and X_3 is Rs. 150, Rs.160 and Rs.200 respectively, and

(iv) Total profit of the firm if it is able to sell its entire production. 7

OR

(b) In an engineering workshop there are 10 machines for drilling, 8 machines for turning and 9 machines for grinding. Three types of brackets are made. Type I brackets require 0 minutes for drilling, 10 minutes for turning and 5 minutes for grinding. The corresponding times for Type II and Type III are 3, 2, 4 and 3, 2, 2 minutes respectively. How many brackets of each type should be produced per hour so that all the machines remain fully occupied during an hour? Solve by matrix algebra. 7

Q 2. (a) The demand function and the average cost function of a manufacturer are $p = 500 - 8x$ and $AC = 2x + 18 + 40/x$ respectively. If the government imposes a tax of Rs. 2 per unit of output, find the profit maximising output and price.

(b) Find the elasticities of demand and supply at equilibrium price for the demand function $p = 300 - 0.5x^2$ and supply function $p = 1.5x^2 + 100$, where p is price and x is quantity. 5

5

Or

(c) Total cost function of a firm is $C(x) = 200x - 12x^2 + x^3$.

Calculate (i) Marginal cost function, (ii) Average cost function, (iii) Output at which Marginal cost is minimum, (iv) Output at which Average cost is minimum and (v) Output at which $AC = MC$. 5

(d) The consumers will demand 50 units of an item at a price of Rs.100 each and 30 units when the price increases to Rs 200.

Find (i) the demand function assuming it is linear, (ii) the total revenue, marginal revenue and average revenue, (iii) actual revenue from sale of 30^{th} unit and (iv) revenue maximisation output and maximum revenue at that point. 5

Q3. (a) What do you understand by "force of interest"? Find effective rate of interest equivalent to the nominal rate 12% converted (a) quarterly (b) yearly (c) monthly. 4

(b) A machine is purchased for Rs. 100,000. It is depreciated at a constant rate of 5% for the first 5 years, after that at 8% for next 5 years and then at 10% for the following 6 years. Find the value of machine after 16 years and the average rate of depreciation during this period if it is calculated by diminishing balance method. 4

Or

(c) Mr. Shyam deposited Rs.100,000 in a bank at the rate of 10% per annum compounded half yearly during first year, 12% compounded quarterly during the second year, at 10% compounded continuously during the third year and at 9% compounded continuously for next two years. Find the amount in his bank after 5 years. 4

(d) How much should a 50 year old man invest now at 8% per year compounded semi-annually to obtain a lump sum of Rs. 500,000 on his retirement at the age of 60 years?