

Department of Management
School of Management & Business Studies
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Even Semester Examination 2022
BCom (Hons.) II Semester

Subject Name: Business Mathematics
Subject Code: BCH203

MM: 75
Time: 03Hours

Sec A

Attempt any six questions, each question carries 5 marks (6 X 5 = 30)

Q1: A monopolist demand curve is $p = 200 - 5q$. Find the Marginal Revenue (MR) & Average Revenue (AR) function. What is the relationship between the slopes of AR & MR curves?

Q2: Verify Euler's theorem:

$$Z = X^3 + Y^3 + 3XY^2$$

Q3: Find the present value of an annuity of ₹4000 payable at the end of each 6 months for 15 years, if money is worth 5% compounded semi-annually.

Q4: MPC (Marginal Propensity to Consume) function is given as:

$$\frac{dc}{dy} = 0.5 - 0.001 Y$$

where 'C' is the Consumption function & 'Y' is disposable income. Find the total consumption function, if at zero level of income, consumption is 0.2.

Q5: In South Delhi, there are 20 Colleges and 50 Schools. Each school has 1 peon, 5 clerks, 1 cashier. Each college, in addition has 1 accountant and 1 head clerk. The monthly salary of each of them is as follows: Peon ₹ 150, ₹ Clerk 250, cashier ₹ 300, accountant ₹ 350, head clerk ₹ 400 per month. Using Matrix notation find:

- i. the total number of posts of each kind in schools and colleges taken together.
- ii. the total monthly salary bill of school and college separately.

Q6: Comment on the relationship between the effective rate of interest and nominal rate of interest.

Q7: Find the differentiation of the following function:

$$Z = 3x^4 + x.e^x + 4\log x - (x^2 + 2x - 3)$$

Q8: Find the compound interest and the amount for ₹ 4800 for 3 years at 4% per annum when the interest is payable quarterly.

Q9: Using Cramer's rule solve the 3 by 3 matrix:

$$x + y - z = 6$$

$$3x - 2y + z = -5$$

$$x + 3y - 2z = 14$$

Sec B

Attempt any three questions, each question carries 15 marks (15 X 3 = 45)

Q1: Given the demand function $p = 90 - x^2$ and the cost function $C = 10 + 2x^2 + 3x^3$, determine the profit maximizing output of a monopolist firm. What would be the impact of ₹ 10 per unit of output on price & profit?

Q2: Solve the given Linear Programming Problem graphically:

$$\text{Maximize: } Z = 8x + y$$

Subject to:

$$x + y \leq 40$$

$$2x + y \leq 60$$

$$x \geq 0, y \geq 0$$

Q3: What is a 'Simplex Method' in LPP? How to perform the optimality test in this method? Briefly explain the exceptional cases encountered in this method.

Q4: A salesman has the following record of sales during three weeks for the three items X, Y & Z which have different rates of commission.

Weeks	Units Sold			Total Commission (₹)
	X	Y	Z	
First	40	30	20	270
Second	50	50	40	450
Third	60	30	10	260

Find out using the *Matrix Inversion method*, the rates of commission on items X, Y & Z.

Q5: Solve the following cases:

- A machine depreciates at the rate of 8% of its value at the beginning of the year. The machine was purchased for ₹ 1,00,000 and the scrap value realized when sold was ₹ 43,440. Find the number of years the machine was used. (Take $\log 0.4344 = -0.36211$ & $\log 0.92 = -0.0362121$) (10 marks)
- What is annuity? Explain the various types of annuities with the help of an example. (5 marks)

Q6: After an advertising campaign a product has sales rate $f(t)$, given by $f(t) = 1000e^{-0.5t}$, where 't' is the number of months since the close of the campaign. Find:

- the total cumulative sales after 5 months
- the sales during the 6th month.
- the total sales as a result of the campaign.