

(Please write your Exam Roll No.)

Exam Roll No. ....

## END TERM EXAMINATION

FIRST SEMESTER [B.COM (HONS.)] JANUARY 2024

Paper Code: BCOM-105

Subject: Quantitative Techniques for  
Commerce

Time: 3 Hours

Maximum Marks: 60

Note: Attempt any five questions. All questions carry equal marks.

- Q1 a) A man has 7 relatives, 4 of them are ladies and 3 gentlemen. His wife has also 7 relatives, 3 of them are ladies and 4 gentlemen. In how many ways can they invite a dinner party of 3 ladies and 3 gentlemen so that there are 3 of men's relatives and 3 of wife's relatives?
- b) Find the sum of the following  $7 + 77 + 777 + \dots$  n terms.

- Q2 Solve the following system of equations using Matrix Inversion method:

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

$$3x + 2y - z = 7$$

$$4x + 5y - 5z = 9$$

- Q3 a) A function f is defined as

$$f(x) = \begin{cases} x+1, & \text{if } -1 < x < 0 \\ x, & \text{if } 0 \leq x \leq 1 \\ 2-x, & \text{if } 1 < x \leq 2 \end{cases}$$

Discuss the continuity of the function at  $x=0$  and  $x=1$ .

- b) If  $u = \sin^{-1} \frac{x^2 + y^2}{x+y}$ , Using Euler's Theorem show that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$$

- Q4 a) A sitar manufacturer can sell  $x$  sitars per week at  $p$  rupees each, where  $5x = 375 - 3p$ . The cost of production is  $500 + 13x + (1/5)x^2$ . Find how many sitars he should manufacture for maximum profit and what is that profit?
- b) If the demand function of a certain commodity is given by  $p = 50 - x$ . Calculate price elasticity of demand when  $p=10$ .

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- Q5 a) The quantity demanded and the corresponding price under pure competition in a market are determined by the demand function and supply function  $P = 1600 - x^2$  and  $p = 2x^2 + 400$  respectively. Determine the corresponding consumer's and producer's surplus.
- b) If the first time you perform a job takes 60minutes, how long will the eighth job take if you are on an 80% learning curve?

- Q6 a) Evaluate the following integral with respect to

$$x: \int \frac{x+5}{(x+1)(x+2)^2} dx$$

- b) The marginal cost function of manufacturing  $x$  pair of shoes is  $6 + 10x - 6x^2$ . The total cost of producing a pair of shoes is Rs. 12.
- Q7 Solve the following Linear programming problem using simplex method:

$$\text{Maximize } Z = 5x_1 + 7x_2$$

Subject to constraints

$$x_1 + x_2 \leq 4$$

$$3x_1 - 8x_2 \leq 24$$

$$10x_1 + 7x_2 \leq 35$$

$$\text{And } x_1, x_2, \geq 0$$

- Q8 a) What is Duality? Explain the relationship between a primal and its dual in Linear Programming Problem.
- b) Obtain the dual for the following LPP:

$$\text{Maximize } Z = 3x_1 + 5x_2 + 7x_3$$

Subject to constraints

$$x_1 + x_2 + 3x_3 \leq 10$$

$$4x_1 - x_2 + 2x_3 \geq 15$$

$$\text{And } x_1, x_2, \geq 0, x_3 \text{ unrestricted variable}$$

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