

2023

(5th Semester)

ECONOMICS

(Honours)

Paper No. : ECO-503 (b)

(**Mathematical Economics**)

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Define differentiation and explain briefly the use of differentiation in economics.

2+4=6

- (b) Find the extreme values of the following functions :

4+4=8

(i) $y = x^3 - 3x + 1$

(ii) $y = 7 + 20x + 2x^2 - x^3$

2. (a) Find the inter-temporal equilibrium price of the following market model and test whether the time path is stable or not :

7

$$Q_{dt} = 30 - 3P_t$$

$$Q_{st} = -10 + 4P_{t-1}$$

- (b) Find the solution of the following difference equations by iterative method or by induction method :

$$3\frac{1}{2} + 3\frac{1}{2} = 7$$

(i) $y_{t+1} = \alpha y_{t+b}$

(ii) $\Delta y_t = -0.2 y_t$

UNIT—II

3. (a) Define differential equation. Briefly explain different kinds of differential equation.

2+3=5

- (b) Solve the following differential equations :

3+3+3=9

(i) $\frac{dy}{dx} = \frac{x}{x^2 + 1}$

(ii) $(x + 2) \frac{dy}{dx} = x^2 + 4x - 9$

(iii) $\left(\frac{1 + x^2}{1 + y} \right) = xy \frac{dx}{dy}$

(3)

4. (a) Define quadratic equation and solve the given equation by factorization method :

2+4=6

$$x^2 + 16x + 60 = 0$$

- (b) Find the solution of the following quadratic equations :

4+4=8

(i) $ax^2 + bx + c = 0$

(ii) $\frac{x^2 - 1}{x^2 - 5} + \frac{x^2 - 5}{x^2 - 9} + \frac{x^2 + 9}{x^2 - 1} = 3$

UNIT—III

5. (a) Define utility. What do you mean by 'total utility' and 'marginal utility'?

8

- (b) Find marginal utility (MU) of the following utility function when consumer consumes 5 units of the commodity x :

6

$$U = 5x^3 - 40x^2 + 600x + 100$$

6. (a) Define elasticity of demand and establish the following relationship :

2+4=6

$$E_d = \frac{AR}{AR - MR}$$

- (b) Explain substitution effect and income effect with the help of Slutsky equation.

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UNIT—IV

7. (a) Define production function. Distinguish between homogeneous and non-homogeneous production function with example. 2+6=8

- (b) Prove that Cobb-Douglas production function always satisfies Euler's theorem. 6

8. (a) Find the production function

$$Q = 40f + 3f^2 - \frac{f^3}{3}$$

Calculate marginal and average production function. 4

- (b) The total factory cost (y) of making X units of a product is given by $y = 5x + 300$ and 75 units are made. Find—

- (i) fixed cost;
- (ii) variable cost;
- (iii) total cost;
- (iv) variable cost per unit;
- (v) average cost per unit. 2×5=10

UNIT—V

9. What are the conditions of a discriminating monopolist to achieve equilibrium? 14
10. A perfectly competitive firm produces two goods in the market whose total cost function is $TC = 2Q_1^2 + 2Q_1Q_2 + 4Q_2^2$. If the prices of the product are fixed at ₹ 20 and ₹ 18 respectively, obtain profit maximising output level. 14
