

Reg. No. :

Name :

Fourth Semester B.A. Degree Examination, May 2021

First Degree Programme under CBCSS

Economics

Core Course – IV

EC 1441 : MATHEMATICAL METHODS FOR ECONOMICS

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. Inverse function.
2. Parameter.
3. Find the third-order derivative of $y = 3x^5 + 23x^2 + 19x$.
4. Adjoint of a matrix.
5. Optimisation.
6. Marginal Rate of Substitution (MRS).
7. Exogenous variable.
8. Differentiate: $y = (3x^2 + 2)^4$.
9. Price elasticity of demand.
10. Scalar matrix.

(10 × 1 = 10 Marks)

SECTION – B

Answer **any eight** questions not exceeding **1** paragraph. Each question carries **2** marks

11. Find the derivative of the following function $y = (x^2 - 8x + 16)^2$.
12. Find the inverse of the following matrices by method of adjoint. $A = \begin{bmatrix} 3 & 2 \\ 5 & 4 \end{bmatrix}$
13. Solve the quadratic equation. $x^2 - 4x + 4 = 0$
14. Find the determinant of the matrix $A = \begin{bmatrix} 5 & 7 \\ 4 & 9 \end{bmatrix}$.
15. Find kA , given $k = -2$ and $A = \begin{bmatrix} 7 & -3 & 2 \\ -5 & 6 & 8 \\ 2 & -7 & -9 \end{bmatrix}$.
16. Determine the integral $\int (4x)^3 dx$.
17. Explain the difference between an exponential function and power function.
18. What is the first-order condition for profit maximisation?
19. Find the point of intersection of the lines with equation: $y = 3x + 4$.
20. Explain the concept of rank of a matrix.
21. Find the equilibrium solution for the following model:
$$Q_d = 30 - P_2$$
$$Q_s = -2 + 4P$$
22. Find the derivative of the following function: $y = \frac{3x - 5}{x^2 + 1}$.
23. Distinguish between discrete and continuous variables.

24. Multiply the two matrices $A = \begin{bmatrix} 2 & 3 \\ 8 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 5 & 2 \\ 4 & 8 & 1 \end{bmatrix}$.
25. If the MR is Rs.25 and the elasticity of demand with respect to price is 2, find AR.
26. What are the conditions of maxima and minima?

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions. Each question carries **4** marks.

27. What are the rules of differentiation?
28. Describe the properties of determinants.
29. Given the demand function $P = 45 - 0.5Q$, find the consumers' surplus when $P_0 = 32.5$ and $Q_0 = 25$.
30. Solve the linear simultaneous equation system

$$20x + 6y = 500$$

$$10x - 2y = 200$$

31. Find

- (a) the total revenue function and
- (b) the demand function, given $MR = 84 - 4Q - Q^2$.

32. Use Cramer's rule to solve for the unknowns in each of the following:

$$2x_1 + 6x_2 = 22$$

$$-x_1 + 5x_2 = 53$$

33. Write a short essay on the main types of matrices.
34. Explain the role of Mathematics in Economics.
35. What are the economic applications of derivatives?

36. Given the demand function $P = 50 - 2Q$. Find the elasticity when the price is 30.
37. Explain the relationship between Average Revenue, Marginal Revenue and elasticity.
38. What do you mean by equation? What are the different types of the equations?

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions not exceeding **4** pages each. Each carries **15** marks.

39. A firm has the following short run production function $Q = 20L^2 - 2L^3$.
- Write the firm's marginal product of labour.
 - At what level of labour input does the MPP_L reach its maximum? At what level does it become zero?
40. Explain various marginal concepts in economics.
41. Write the following system in matrix form and solve it.

$$2x_1 - 2x_2 + 4.5x_3 = 20$$

$$-2x_1 + 4x_3 = 5$$

$$3x_2 - 2x_3 = 2$$

42. A monopolistically competitive firm has the following total cost function.
 $TC = 0.03Q^2 + 12Q + 500$. if the demand function for the firm's product is
 $P = 33 - 0.005Q$.
 Find the firm's profit maximizing level of output and its profit.
43. Write an essay on consumer's surplus and producer's surplus.
44. Explain Cobb-Douglas production function.

(2 × 15 = 30 Marks)