D 131139 (Pages : 5) Name...

Reg. No...................................

FIRST SEMESTER M.A. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2025

(CBCSS)

Economics

ECO 1C 04—QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS—I

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Part A (Multiple Choice Questions)

Answer **all** *questions.*
Each question carries a weightage of 1/5.

1. The inverse of a square matrix A, denoted as $A^{(-1)}$, is a matrix that, when multiplied by A, yields the —————————.

   (a) Transpose. (b) Identity matrix.

   (c) Determinants. (d) None of the above.

2. If the total utility function is $U(q) = 4q^3 - 6q^2 + 2q + 7$, what is the marginal utility function ?

   (a) $U'(q) = 12q^2 - 12q + 2.$ (b) $U'(q) = 12q^2 - 6q + 2.$

   (c) $U'(q) = 12q^2 - 6q - 2.$ (d) $U'(q) = 12q^2 - 12q - 2.$

3. How do changes in interest rates affect the yield of existing bonds ?

   (a) Changes in interest rates have no effect on bond yields.

   (b) Increases in interest rates lead to higher bond yields.

   (c) Decreases in interest rates lead to higher bond yields.

   (d) Changes in interest rates can have varying effects on bond yields.

Turn over

4. The differential equation $dy/dx = 5y + e^x$ is :

    (a) Linear.   (b) Non-linear.

    (c) Exact.   (d) None of these.

5. The partial derivative of the function $f(x, y) = 3x^2y - 2xy^3$ with respect to y is :

    (a) $6xy - 6y^3$.   (b) $6x^\wedge 2 - 6xy^2$.

    (c) $6x - 6y^2$.   (d) $6x^\wedge 2y - 6xy^2$.

6. The IRR formula is used to calculate the discount rate that makes the :

    (a) Initial investment zero.

    (b) Future value of cash flows zero.

    (c) Present value of cash flows zero.

    (d) Average rate of return zero.

7. In a geometric sequence, if the first term is 2 and the common ratio is 3, what is the 5th term ?

    (a) 48.   (b) 54.

    (c) 64.   (d) 72.

8. The equation $x^2 + y^2 = 25$ represents a :

    (a) Linear function.   (b) Quadratic function.

    (c) Cubic function.   (d) Implicit function.

9. The Lagrangian multiplier method is used to find the :

    (a) Minimum value of a function.

    (b) Maximum value of a function.

    (c) Critical points of a function.

    (d) Optimal value of a function subject to constraints.

10. X invests Rs. 5,000 in a savings account with an annual interest rate of 4 %. If the interest is compounded annually, what is the total amount in her account after 3 years ?

   (a) Rs. 5,600.

   (b) Rs. 5,800.

   (c) Rs. 6,000.

   (d) Rs. $6,200.

11. What is the integral of the function $f(x) = 3x^2 + 2x + 1$?

   (a) $x^3 + x^2 + x + \mathrm{C}.$

   (b) $x^3 + x^2 + 1 + \mathrm{C}.$

   (c) $3x^3 + x^2 + x + \mathrm{C}.$

   (d) $3x^3 + x + \mathrm{C}.$

12. The function $f(x) = e^x$ is :

   (a) Quadratic.

   (b) Linear.

   (c) Exponential.

   (d) Logarithmic.

13. The rank of a matrix is defined as :

   (a) The sum of all its elements.

   (b) The number of rows in the matrix.

   (c) The number of columns in the matrix.

   (d) The maximum number of linearly independent rows or columns in the matrix.

14. Which of the following statements about second-order difference equations is true ?

   (a) Second-order difference equations involve two variables.

   (b) Second-order difference equations can be solved using only one initial condition.

   (c) Second-order difference equations describe the relationship between consecutive terms in a sequence.

   (d) Second-order difference equations are always linear.

15. Find the limit of the function $f(x) = \left(3x^2 - 4x + 2\right) / \left(2x - 3\right)$ as x approaches 2.

   (a) 6.

   (b) 8.

   (c) 4.

   (d) 2.

(15 × 1/5 = 3 weightage)

Turn over

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Part B (Very Short Answer Questions)

Answer any **five** *questions.*
Each question carries a weightage of 1.

16. Define Symmetric Matrix

17. State the quotient rule of differentiation.

18. What is a production function?

19. Define a differential equation

20. What is a multivariate function?

21. What is meant by a total derivative?

22. State the Rule for the derivative of an Exponential function

23. What is a Cubic function?

$(5 \times 1 = 5$ weightage)

Part C (Short Answer Questions)

Answer any **seven** *questions.*
Each question carries a weightage of 2.

24. Differentiate between an odd and even function.

25. State the advantages and disadvantages of Net Present Value.

26. Solve the first-order differential equation $dy/dx = 2x + 6$.

27. A firm has a production function given by $Q = 10K^{0.5} L^{0.5}$, where Q represents the output, K represents capital, and L represents labor. The firm faces prices of PK = 20 and PL = 10 for capital and labor, respectively. Determine the levels of capital and labor that maximize the firm's profit.

28. Solve the difference equation $y_{t+1} - 0.5y_t = 2$ given $y_0 = 1$.

29. A company is considering investing in a new production line. The initial investment for the production line is Rs. 2,00,000. The expected cash flows from the project are as follows: Rs. 50,000 in Year 1, Rs. 70,000 in Year 2, Rs. 80,000 in Year 3, Rs. 100,000 in Year 4, and $120,000 in Year 5. The company's discount rate is 12 %. Calculate the net present value (NPV) of the investment project.

30. Find the characteristic roots of the matrix $A = [[1, 3], [2, 2]]$.

31. State the relationship between interest rates and the price of bonds

32. Suppose the demand function for a product is given by $Q = 200 - 5P$, where Q represents the quantity demanded and P represents the price. Calculate the consumer's surplus at the equilibrium price.

33. Determine the elasticity of demand when the price increases from Rs. 40 to Rs. 50, given the demand function $Q = 200 - 4P$.

$(7 \times 2 = 14$ weightage)

Part D (Essay Type Questions)

Answer any **two** *questions.*
Each question carries a weightage of 4.

34. Solve the following system of equations using Cramer's rule :

$$4x + 2y - 3z = 10$$
$$2x - 5y + z = -7$$
$$3x + y + 4z = 5.$$

35. Maximize the function $f(x, y) = x^2 + 4xy + y^2$ subject to the constraint $x + 2y = 6$ using the Lagrange multiplier method.

36. A firm has a production function given by $Q = K^{0.5} L^{0.5}$, where Q represents the output, K represents capital, and L represents labor. The cost of each unit of capital is Rs. 25 and the cost of each unit of labor is Rs. 15. The firm has a fixed budget of Rs. 5,000. Determine the levels of capital and labor that maximize the output and find the maximum output.

37. Find the maximum value of die function $f(x, y, z) \, xyz$ subject to the constraint $x^2 + y^2 + z^2 = 1$.

$(2 \times 4 = 8$ weightage)