D1AEC2304 **(4 Pages)** **Name.....**
Reg.No.....

FIRST SEMESTER M.A. DEGREE EXAMINATION, NOVEMBER 2023
(Regular/Improvement/Supplementary)
ECONOMICS
FECO1C04- QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS I

Time: 3 Hours **Maximum Weightage: 30**

Part A: Multiple choice questions. Answer *all* questions. Each carries $^1/_5$ weightage.

1. Which of the following is an example of linear function?

   a) $y = 3x^2 + 2x + 9$ b) $y = \frac{x}{3} + 2$ c) $y = \log_{10} x$ d) $y = e^x$

2. Which of the following is not a type of matrix?

   a) Square matrix b) Scalar matrix c) Space matrix d) Term matrix

3. What is true regarding determinant of a matrix?

   a) The concept of determinant is applicable to square matrices only.

   b) To find determinant, subtract diagonal elements together.

   c) Determinant is a vector value that can be computed from the elements of a trace matrix.

   d) Both (a) and (c).

4. Chain rule of differentiation is also known as:

   a) Functional rule b) Product rule

   c) function of function rule d) Quotient rule

5. $y = \frac{1}{x}$, $\frac{dy}{dx}$?

   a) 1 b) $\frac{1}{x^2}$ c) $-\frac{1}{x^2}$ d) x^2

6. $\lim_{x \to 2} \frac{(x-2)^2}{x^2 - 4}$ is ……..

   a) 0 b) 1 c) 2 d) 3

(P.T.O.)

7. $\int \frac{1}{x} dx = ?$

a) $x + c$ b) $\frac{1}{x} + c$ c) $\log x + c$ d) $\frac{1}{x^2} + c$

8. $\frac{\partial}{\partial x}(3x^2 + xy + 4y^2)$ is ……..

a) $x+8y$ b) $6x+y$ c) $6x+8y$ d) $x+y$

9. The differential dy of the function $y = x^3 + 4$ is .....

a) $3x^2$ b) $(3x^2+4)dx$ c) $3x^2dx$ d) none of these

10. The order of the differential equation $\frac{dy}{dt} = 5x + 7$ is ……..

a) 0 b) 1 c) 2 d) 3

11. The general solution of the differential equation $\frac{dy}{dx} = xe^x$ is .....

a) $y = (x-1)e^x + c$ b) $y = (x + c)$ c) $y = (xe^x + c)$ d) none of these

12. The order of the difference equation $\Delta^2 Y_t + \Delta Y_t = Y_t$ is

a) 1 b) 2 c) 3 d) 4

13. The total of first 100 number is ……..

a) 5050 b) 10100 c) 7500 d) 5000

14. If n^{th} term of a G.P is 2^n, then the sum of its 6 terms is …….

a) 126 b) 124 c) 190 d) 154

15. The compound interest on 12000 for 3 years at 10% per annum compounded annually is ……

a) 3972 b) 3872 c) 3772 ` d) 3672

(15 × 1/5= 3 weightage)

Part B: Answer any *five* questions. Each carries *one* weightage.

16. Find the adjoint and inverse of the matrix $\begin{bmatrix} 3 & 2 & 2 \\ 2 & 1 & 4 \\ 1 & 3 & 5 \end{bmatrix}$.

17. State any two properties of determinants and find the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$.

18. Explain the marginal concepts related to demand and supply function.

19. Find the maximum and minimum values of $\frac{1}{3}x^3 - \frac{5}{2}x^2 + 4x + 10$.

20. Find the partial derivatives $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ of the function $z = \log(x^2 + y^2)$.

21. Find the general and particular solutions for the differential equations $\frac{dy}{dx} - 6x + 2 = 0$ given that $x = 3$ when $y = 0$.

22. Write a short note on the relationship between interest rates and price of bonds.

23. Find the sum of the first 15 terms of the series: 20+18+16+14+…..

(5 × 1= 5 weightage)

Part C: Answer any *seven* questions. Each carries *two* weightage.

24. Find the rank of the matrix $\begin{bmatrix} 1 & 0 & 2 & 3 \\ 2 & 1 & 0 & 1 \\ 4 & 1 & 4 & 7 \end{bmatrix}$.

25. Solve the quadratic equation $x^2 + 6x + 10 = 0$.

26. State any three rules of differentiation.

27. A demand curve is given by $p = aq^{\beta}$. Find the marginal revenue function and the elasticity of demand.

28. Evaluate the integrals: (i) $\int_1^4 10x\,dx$ (ii) $\int_1^3 (4x^3 + 6x)\,dx$

29. Explain constrained optimization with Lagrangian multipliers.

30. Define a differential equation. Determine the general solution for the differential equation $\frac{dy}{dt} = e^{0.5t}$.

31. Write down any two economic applications of differential equations.

32. Distinguish between simple interest and compound interest.

33. The sum of the first 12 terms of an A.P. is 222, the sum of the first 5 terms is 40. Write down the first four terms of the series.

(7 × 2= 14 weightage)

(P.T.O.)

Part D: Answer any *two* questions. Each carries *four* weightage.

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

$$4x_1 + 2x_2 - x_3 = 40$$
$$2x_1 + 3x_2 = 43$$
$$x_1 + 3x_3 = 38$$

35. Explain the concept of total derivative. Also find the total derivative $\frac{dy}{dt}$, given $y = 2x_1^2 - 5x_1x_2 - 6x_2^2$, where $x_1 = 3t^2$ and $x_2 = 5 - 2t$.

36. a) A firm sells a product of Rs.9 per unit. The total cost of the firm for producing x units is given by $C = 20 + 0.6x + 0.01x^2$. How many units should be made to achieve maximum profit? Verify that the condition for a maximum is satisfied.

b) A company finds that it can sell out a certain item for Rs. 2 per unit. The cost function estimated to be $100 + \frac{1}{2}\left(\frac{q}{20}\right)^2$. What is the average cost when 100 units are produced? Find the marginal revenue and marginal cost?

37. Solve the equation below using the formula for a general solution.
$2\frac{dy}{dt} - 2t^2 y = 9t^2$, $y(0) = -2.5$.

(2 × 4 =8 weightage)