

FIRST SEMESTER M.A. DEGREE EXAMINATION, NOVEMBER 2022
(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 $\frac{1}{5}$ weightage.**

1. The general form $y = a^x$ is of
 - a) Quadratic function
 - b) Exponential function
 - c) Logarithmic function
 - d) Cubic function
2. The rank of $\begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$ is
 - a) 0
 - b) 1
 - c) 2
 - d) none of these
3. A square matrix whose elements above and below the diagonal elements are all zero is called
 - a) Triangular matrix
 - b) Zero matrix
 - c) Diagonal matrix
 - d) All of these
4. $\frac{d}{dx} \left(\frac{1}{x} \right)$ is
 - a) $\frac{1}{x}$
 - b) $\frac{-1}{x^2}$
 - c) $-\frac{1}{x}$
 - d) $\frac{1}{x^2}$
5. The process of finding $\frac{dy}{dx}$ is called
 - a) Differentiation
 - b) Integration
 - c) Diagonalisation
 - d) None of the above
6. The marginal revenue is the
 - a) Rate of change in total revenue per unit increase in output
 - b) Rate of change in total cost per unit increase in output
 - c) Average revenue per unit for the first Q successive units sold
 - d) None of the above
7. $\frac{\partial}{\partial x} (2x - 3y + 1)$ is
 - a) 2
 - b) -3
 - c) 1
 - d) 0

8. $\int \frac{1}{\sqrt{x^3}} dx$ is
- a) $3x^2 + c$ b) $-\frac{2}{x^{0.5}} + c$ c) $\frac{1}{\sqrt{3x^2}} + c$ d) None of these
9. $\int_1^3 (x + 2) dx$ is
- a) 2 b) 4 c) 6 d) 8
10. The order of the difference equation $Y_{t+1} - 1.2Y_t = 0$ is
- a) 0 b) 1 c) 2 d) 3
11. An equation which contains derivatives is called
- a) Difference equation b) Quadratic equation
- c) Differential equation d) None of these
12. $\frac{dy}{dx} = 10x$ is a differential equation of order
- a) 0 b) 1 c) 2 d) 3
13. A list of numbers which follow a definite pattern or rule is called
- a) Series b) List c) Sequence d) None of these
14. The sum of first 15 terms of the series $20+18+16+14+\dots$ is
- a) 100 b) 68 c) 70 d) 90
15. A technique used to appraise investment projects is
- a) Simple interest b) Compound interest c) Net present value d) None of these

(15 × 1/5 = 3 weightage)

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

16. Find the adjoint of the matrix $\begin{bmatrix} 2 & 3 & -1 \\ 0 & 1 & -1 \\ 2 & 1 & 2 \end{bmatrix}$.
17. Find the rank of the matrix $\begin{bmatrix} 1 & 0 & 2 & 3 \\ 2 & 1 & 0 & 1 \\ 4 & 1 & 4 & 7 \end{bmatrix}$.
18. Explain power rule for differentiation.
19. If the demand law is $p = \frac{10}{(x+1)^2}$, find the elasticity of demand in terms of x . If the quantity x is 4 units find the elasticity of demand.

20. Find the partial derivatives $\frac{\partial y}{\partial x_1}$ and $\frac{\partial y}{\partial x_2}$ of the function $y = 2x_1^2 - 3x_1x_2^3 + x_2$.
21. Find $\int \frac{x+5x^2}{x^2} dx$.
22. Find the general solution of the difference equation $Y_{t+1} - 0.8Y_t = 0$.
23. Explain any one technique to appraise investment projects.

(5 × 1 = 5 weightage)

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

24. Find the inverse of the matrix $\begin{bmatrix} 3 & 2 & 2 \\ 2 & 1 & 4 \\ 1 & 3 & 5 \end{bmatrix}$.
25. Evaluate the determinants: i) $\begin{vmatrix} 1 & 2 & -5 \\ 0 & 6 & 5 \\ -1 & 2 & 7 \end{vmatrix}$ ii) $\begin{vmatrix} -3 & 0 & 3 \\ 3 & 2 & 6 \\ 4 & 0 & 9 \end{vmatrix}$.
26. Given the demand function $p = 6 - 0.5Q$, find the value of marginal revenue for $Q = 1, 2, 3, 4, 5, 6, 7$.
27. Find the maximum and minimum values of $y = \frac{2}{3}x^3 + \frac{1}{2}x^2 - 6x + 8$.
28. Find the total differential dy of the function $y = 2x_1x_2 + x_1^2 - 2x_2^2$.
29. Maximize $y = x_1x_2 + 2x_1$ subject to $x_1 + 2x_2 = 20$.
30. Find the particular solution for the differential equation $\frac{dy}{dt} - 10t - 2 = 0$ given $y = 15$ when $t = 0$.
31. For each of the following difference equations, state (i) the order of the equation and (ii) whether the equation is homogeneous or not.
 a) $P_{t+1} - 0.8P_t = 0$ b) $Y_{t+2} = 8 - Y_{t+1}$ c) $Y_{t+2} = 80 + Y_t$.
32. Explain the terms: i) Annuities ii) Debit repayments and iii) Sinking funds.
33. The sum of the first 12 terms of an AP is 222, the sum of the first 5 terms is 40. Write down the first four terms of the series.

(7 × 2 = 14 weightage)

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

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

$$x + y = 12$$

$$2x + 5y + 2z = 20$$

$$6x + 3y + 6z = 0.$$

(P.T.O.)

35. a) Given $y = 2x_1x_2 + x_1^2$ where $x_1 = 2x_2 + 3$, find out total derivative $\frac{dy}{dx_2}$.
- b) Find the total derivative $\frac{dy}{dt}$ given $y = 3x_1^2 - 5x_1x_2 - 2x_2^2$ where $x_1 = 2t^2$ and $x_2 = 3 - 2t$.
36. A firm's demand function is given by the equation $P = \frac{150}{e^{0.02Q}}$. Write down the equations for Total Revenue (TR) and Marginal Revenue (MR). Determine the output Q at which TR is a maximum.
37. A taxi service must replace cars every 5 years at a cost of £450000. At an 8% rate of interest, calculate:
- a) the size of the fund if £4000 is deposited at the beginning of each month.
- b) the size of each quarterly payment necessary to meet this target.

(2 × 4 = 8 weightage)