

FIRST SEMESTER M.A. DEGREE EXAMINATION, NOVEMBER 2024
(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. A function with only one element for the range is called a function.
(a) simple (b) quadratic (c) constant (d) one to one
2. Determinant value of a singular matrix is
(a) 0 (b) not equal to zero (c) any value (d) none of these
3. What is the transpose of a co factor matrix?
(a) inverse matrix (b) singular matrix (c) non-singular matrix (d) Adjoint of a matrix
4. $\lim_{x \rightarrow 3} \frac{x^2 - 4x + 3}{2x^2 - 11x + 15}$ is
(a) 0 (b) ∞ (c) 2 (d) $\frac{1}{2}$
5. If $y = 4x^{-5}$, $\frac{dy}{dx} = \dots\dots\dots$
(a) $-20 x^5$ (b) $20 x^5$ (c) $20 x^{-6}$ (d) $-20 x^{-6}$
6. What is the value of slope in the inflexion point?
(a) -1 (b) 0 (c) 1 (d) 2
7. $\int 5\sqrt{x} \, dx = ?$
(a) $\frac{10}{3} x^{\frac{3}{2}} + c$ (b) $\frac{10}{3} x^{\frac{5}{2}} + c$ (c) $10 x^{\frac{3}{2}} + c$ (d) $5 x^{\frac{1}{2}} + c$
8. $Q = 24 - 2p$. What is the consumer surplus at $p = 5$?
(a) 20 (b) 23 (c) 24 (d) 25

(P.T.O.)

9. $\int_2^4 2x^2 dx = \dots\dots\dots$
- (a) $\frac{121}{3}$ (b) $\frac{131}{3}$ (c) $\frac{112}{3}$ (d) $\frac{8}{9}$
10. The order of the differential equation $(\frac{dy}{dt})^4 - 5t^5 = 0$ is $\dots\dots\dots$
- (a) 0 (b) 1 (c) 4 (d) 5
11. The general solution for the differential equation $\frac{dy}{dt} + 4y = 12$ is $\dots\dots\dots$
- (a) $y(t) = Ae^{-4t} + 3$ (b) $y(t) = 3e^{-4t} + 3$
- (c) $y(t) = 12e^{-4t}$ (d) none of these
12. The order of the difference equation $I_t = a(Y_{t-1} - Y_{t-2})$ is
- (a) 1 (b) 2 (c) 3 (d) 4
13. The sum of the first 15 terms of the series $20+18+16+14+\dots\dots$ is:
- (a) 68 (b) 90 (c) 143 (d) 126
14. The compound interest rate required for Rs. 10000/- to grow to Rs. 20000/- in six years:
- (a) 10% (b) 12% (c) 7.5% (d) 7%
15. A mortgage of Rs. 200000/- is to be repaid over a 25 year period at a fixed interest rate of 4.5%. Then the monthly repayments is $\dots\dots\dots$
- (a) 10000 (b) 1101 (c) 1001.6650 (d) 1111.6650

(15 $\times$ 1/5 = 3 weightage)

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

16. Find the inverse of the matrix $\begin{bmatrix} 4 & 0 & 1 \\ 3 & 2 & 1 \\ 1 & 5 & 2 \end{bmatrix}$.
17. Examine the continuity of $y = \frac{x^2-1}{x-1}$ at $x = 1$.
18. If $y = \frac{(x-3)^2}{x+1}$, find $\frac{d^2y}{dx^2}$ at $x = 1$.
19. Find the maximum and minimum values of the function $y = 2x^3 - 3x^2 - 12x + 4$.
20. Find $\int x(x+1)^9 dx$.
21. Solve the first order difference equation $y_{t+1} + 3y_t = 2$ and $y_0 = 5$.
22. How do you calculate sinking funds?

23. The sum of the first 12 terms of an AP is 222, the sum of the first 5 terms is 40. Write the first four terms of the series.

(5 × 1 = 5 weightage)

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

24. What are the important properties of determinants?
25. Find the characteristic roots and characteristic vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.
26. Given the price equation, $P = 100 - 2Q$ where Q is quantity demanded, find marginal revenue and point elasticity of demand when $Q = 10$.
27. Evaluate $\int_2^5 (x^3 - 2x + 3)(8x - 8)dx$.
28. Given the demand function $Q = \sqrt{(60 - \frac{3}{2}P)}$ and the supply function $Q = -3 + 2P$, find consumer's surplus and producer's surplus.
29. Explain economic applications of differential equations.
30. Solve the differential equation $\frac{dy}{dx} + 4y = 10$.
31. Explain Cobb Web model.
32. Two banks in a local town quote the following nominal interest rates: bank A pays interest on a savings account at 6.60% compounded monthly and bank B pays 6.65% on a savings account compounded semi-annually. Which bank pays its savers the most interest?
33. How much should you pay for an annuity of Rs.1000/- a year payable in arrears for 20 years, assuming an interest rate of 6%, if you are to break even?

(7 × 2 = 14 weightage)

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

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

$$4x_1 + 5x_2 - x_3 = 35$$

$$2x_1 + 3x_2 + 2x_3 = 35$$

$$x_1 + 4x_2 + 2x_3 = 36.$$

35. a) Given the total cost function $C = 10000 + 100q - 10q^2 + \frac{1}{3}q^3$, find:

i) Slope of the marginal cost function

ii) Output at which marginal cost is equal to average variable cost.

(P.T.O.)

b) Given the production function $Q = 5L^{\frac{1}{2}}$ and the price equation $P = 200 - 2Q$,

obtain the marginal revenue product of labour (L) when $L = 25$.

36. Find the extreme value(s) of the function $y = -2x_1^3 + 4x_1x_3 + 2x_2 - x_2^2 - 2x_3^2$.

37. To provide future education costs, a family considers various methods of saving. Assume saving will continue for a period of 10 years at an interest rate of 7.5% per annum.

a) Calculate the value of the fund at the end of 10 years when a single deposit of Rs. 2000 is made annually.

b) How much should be deposited each month if the final value of the fund is Rs. 40000?

(2 × 4 = 8 weightage)