

FIRST SEMESTER M.A. DEGREE EXAMINATION, NOVEMBER 2021
(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. Parabola is the graph of a
(a) Linear function (b) Quadratic function
(c) Cubic function (d) None of the above
2. The rank of $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 6 & 9 \\ 2 & 4 & 6 \end{bmatrix}$ is
(a) 0 (b) 1 (c) 2 (d) 3
3. The characteristic roots of the matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ are
(a) 1, 2 (b) 1, 1 (c) 0, 1 (d) 0, 0
4. $\lim_{x \rightarrow 1} \frac{x^2+x-2}{x^2-x}$ is
(a) 0 (b) 1 (c) 2 (d) 3
5. If $f(x) = 4 - x^2$, then $f'(-3)$ is
(a) -5 (b) -6 (c) 6 (d) 5
6. For the demand function $x = \frac{27}{p^3}$ the elasticity of demand is
(a) 3 units (b) 4 units (c) 5 units (d) 6 units
7. $\frac{\partial}{\partial y}(x^2 + 2xy - y^2)$ is
(a) $2(x - y)$ (b) $-2y$ (c) $2x$ (d) $2x+2y$

(P.T.O.)

8. $\int \frac{\log x}{x} dx$ is
- (a) $\frac{(\log x)^2}{2} + c$ (b) $\frac{\log x^2}{2} + c$ (c) $\frac{\log x}{2} + c$ (d) $\frac{\log x}{4} + c$
9. If $y = 4x_1x_2 + x_1^2$ where $x_1 = 3x_2 + 5$, then total derivative $\frac{dy}{dx_2}$ is
- (a) $4x_1 + 2x_1$ (b) 3 (c) $12x_2 + 10x_1$ (d) none of the above
10. Which of the following is an explicit function of x?
- (a) $y = \frac{2x}{x^2+1}$ (b) $x^3y + y - 2x = 0$
(c) $x^2 - y^2 + 3x = 5y$ (d) All the above
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 the above
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 common difference of the arithmetic sequence -16, -6, 4, 14,... is
- (a) 6 (b) -10 (c) -6 (d) 10
14. The common ratio of the geometric sequence -2, -10, -50, -250,... is
- (a) -5 (b) 5 (c) -8 (d) 8
15. Mr. X paid Rs. 9600 as interest on a loan he took 5 years ago at 16% rate of simple interest. What was the amount he took as loan?
- (a) 16400 (b) 12000 (c) 12500 (d) 18000

(15 × 1/5 = 3 weightage)

Part B: Very short answer questions. 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. Find the rank of the matrix $\begin{bmatrix} 2 & 5 & 4 \\ 3 & 0 & 6 \\ 1 & 2 & 2 \end{bmatrix}$.

18. Write a short note on the application of derivatives.

19. Find the output at which the average cost is minimum from the total cost function:

$$TC = 2Q^2 + 5Q + 18.$$

20. Find the partial derivatives $\frac{\partial y}{\partial x_1}$ and $\frac{\partial y}{\partial x_2}$ of the function $y = 4x_1^2 - 2x_1^2x_2^3 + x_2$.

21. Find $\int x \log x dx$.

22. Write a short note on Cob Web model.

23. Explain the relationship between interest rates and price of bonds.

(5 × 1 = 5 weightage)

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

24. Find the characteristic roots of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

25. Explain exponential and logarithmic functions and their corresponding graphs.

26. Find the first and second derivatives of $y = \frac{4x^3}{3} - x$.

27. The demand function of a firm is $P = 15 - 2x$ and the cost function is $C(x) = 2x$. Find marginal cost and marginal revenue.

28. Let $y = x_1^2 + 2x_2$ where $x_2 = x_1^3 + 5$. Find $\frac{dy}{dx_1}$.

29. Find $\int (8x + 2)(2x^2 + x)^5 dx$.

30. Solve the difference equation $Y_{t+1} - 1.2Y_t = 0$ by iteration for years 2, 3, 4 and 5 given that income in year 1 is £ 18000.

31. List some of the applications of difference equations in economics.

32. Distinguish between simple interest and compound interest.

33. Calculate the amount owed on a loan of £1000 over three years at an interest rate of 8% compounded annually.

(7 × 2 = 14 weightage)

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

34. Solve the following using matrix inversion method.

$$5x + 3y + 3z = 48$$

$$2x + 6y - 3z = 18$$

$$8x - 3y + 2z = 21$$

(P.T.O.)

35. (a) Given $y = 5x_1 + x_1x_2 - 2x_2^2$ where $x_1 = 5x_2^2$ find out total derivative $\frac{dy}{dx_2}$.

(b) Find the total derivative $\frac{dy}{dt}$ given $y = 2x_1^2 - 5x_1x_2 - 6x_2^2$ where

$$x_1 = 3t^2 \text{ and } x_2 = 5 - 2t.$$

36. (a) A radio manufacturer produces x sets per week at a total cost of Rs. $x^2 + 78x + 2500$. The demand function is $8x = 600 - p$, where p is the price per unit. When is the net revenue maximum? What is the price per set then?

(b) 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.

37. (a) Find the sum of the first 15 terms of the series $20+18+16+14+\dots$

(b) Find the sum of the first 12 terms of the series $4+2+1+\frac{1}{2}+\frac{1}{4}+\dots$

(2 × 4 = 8 weightage)