

(Pages : 4)

Name.....

Reg. No.....

FIRST SEMESTER M.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2020
(CBCSS)

Economics

ECO 1C-04—QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS—I
(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. In cases where choices are provided, students can attend **all** questions in each section.
2. The minimum number of questions to be attended from the Section / Part shall remain the same.
3. There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.

Part A (Multiple Choice Questions)*Answer all questions.**Each question carries $\frac{1}{4}$ weightage.*

1. If A and B are matrices of order 3×2 and 2×1 respectively, then the product AB is of order :
 (a) 3×3 . (b) 3×4 .
 (c) 2×3 . (d) 2×4 .
2. Co-factor of an element of a matrix is also known as :
 (a) Minor. (b) Signed minor.
 (c) Diagonal element. (d) Characteristic root.
3. If A is a singular matrix, then A^{-1} is :
 (a) Non-singular. (b) Singular.
 (c) Symmetric. (d) Not defined.
4. The determinant value of the matrix $\begin{bmatrix} -4 & 2 \\ -3 & -4 \end{bmatrix}$ is :
 (a) 22. (b) -22.
 (c) 10. (d) -10.

Turn over

5. Find the equilibrium price if the demand and supply functions are given by
 $D = -9 + p$ and $S = -3 - p$:

- (a) 2. (b) 3.
(c) 4. (d) 5.

6. Derivative of $f(x) = e^x$ at $x = 0$ is:

- (a) 0. (b) 1.
(c) e . (d) -1 .

7. If R is the total revenue, the marginal revenue is:

- (a) $\frac{R}{x}$. (b) $R \times x$.
(c) $\frac{x}{R}$. (d) $\frac{dR}{dx}$.

8. The slope of the equation $2x - 4y + 4 = 0$ is:

- (a) $\frac{2}{3}$. (b) $\frac{3}{2}$.
(c) $\frac{1}{2}$. (d) 2.

9. Find the last term of the series $-3, -1, 1, \dots$ 40 terms:

- (a) 75. (b) 65.
(c) 30. (d) 85.

10. The integral of $6x^2$ is:

- (a) $6x^3$. (b) $2x^3$.
(c) $2x^2$. (d) $6x^2$.

11. The inverse process of integration is:

- (a) Matrix inversion. (b) Matrix multiplication.
(c) Differentiation. (d) Optimization.

12. Find $\lim_{x \rightarrow 2} x^5 + 7$:

- (a) 32. (b) 39.
(c) 36. (d) 33.

($12 \times \frac{1}{4} = 3$ weightage)

Part B (Short Answer Type)

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

13. Define characteristic equation and characteristic roots.
14. Explain the rules of limits.
15. Define continuity of a function. Check the continuity of $f(x) = \frac{1}{x-2}$ at $x=2$.
16. Solve the differential equation $\frac{dy}{dx} = \frac{y}{1+x}$.
17. Differentiate $y = \frac{x^3 + 2x}{x^2 + 1}$ with respect to x .
18. If average revenue is Rs. 40 and the elasticity is 5, find the marginal revenue.
19. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 6 & 7 \end{bmatrix}$. Verify that $(AB)^T = B^T \cdot A^T$.
20. Find the sum of 10 terms of an arithmetic progression whose 7th term is 30 and 13th term is 54.

(5 × 1 = 5 weightage)

Part C (Paragraph Type)

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

21. Solve the following equations by using Crammer's rule :
 $2x_1 + 3x_2 = 13$ and $x_1 + 7x_2 = 23$.
22. Find the rank of $A = \begin{bmatrix} 1 & 2 & 0 & 5 \\ 3 & 1 & 2 & 2 \\ 2 & 4 & 0 & 10 \end{bmatrix}$.
23. A company has examined the cost structure and has determined that $C = 100 + 0.015x^2$ and $R = 3x$ where C is the total cost, R is the total revenue and x is the number of units produced. Find the production rate x that will maximize profits of the company. Find out that profit.
24. Define price elasticity of supply. Find the elasticity of supply when price = 5 units. Supply function is given by $q = 25 - 4p + p^2$ where q is the supply at price p .

Turn over

25. Define total differential. Find the total differential of $z = \frac{x}{x+y}$.
26. Explain various functions in Economics.
27. The sum of three numbers in a geometric progression is 35 and their product is 1000. Find the numbers.
28. Evaluate the following definite integrals :
- (a) $\int_1^3 (x^3 + x + 6) dx$; and (b) $\int_1^3 (4x^3 + 6x) dx$.
29. Explain the optimization techniques using Lagrangian multiplier method. Maximize the utility function $U = 4xy - y^2$ subject to the constraint $2x + y - 6 = 0$.
30. If $z = \frac{x^2 y^2}{x+y}$, show that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 3z$.

(7 × 2 = 14 weightage)

Part D (Essay Type)*Answer any two out of four questions.**Each question carries 4 weightage.*

31. Solve the following equations using matrix inversion method :
- $$\begin{aligned} 2x + 4y - z &= 15 \\ x - 3y + 2z &= -5 \\ 6x + 5y + z &= 28. \end{aligned}$$
32. (a) The cost for a monopolist firm producing x items per week is given to be $4x^2 - 80x + 500$ rupees. To have minimum Cost, how many units should be produced per week?
- (b) Revenue function of a firm is given by $R = 14x - x^2$ and the cost function is $C = x(x^2 - 2)$. Find (i) Average cost ; (ii) Marginal cost ; (iii) Marginal revenue ; and (iv) Equilibrium position.
33. (a) $z = \frac{x^3 - y^3}{xy}$ show that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = z$.
- (b) If $u = x^3 - 3xy^2$ and $v = 3x^2y - y^3$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2}$.
34. India's population in 1950 and 1967 was 36 and 51.4 crore persons respectively. Find the annual arithmetic and geometric rate of growth.

(2 × 4 = 8 weightage)