

D 53896

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Name.....

Reg. No.....

**FIRST SEMESTER P.G. DEGREE EXAMINATION
NOVEMBER 2023**

(CCSS)

Economics

ECO 1C 03—MATHEMATICS FOR ECONOMICS

(2022 Admissions)

Time : Three Hours

Maximum : 50 Marks

Part A (Multiple Choice Questions)*Answer all questions.**Each question carries 1 mark.*

1. Let the matrix A is of order 2×3 and another matrix B is of order 3×4 , then the product AB is of order :
(a) 3×3 . (b) 3×4 .
(c) 2×3 . (d) 2×4 .
2. The derivative of $f(x) = e^x$ at $x = 0$ is :
(a) 0. (b) 1.
(c) e . (d) -1 .
3. The slope of the equation $2x - 4y + 4 = 0$ is :
(a) $\frac{2}{3}$. (b) $\frac{3}{2}$.
(c) $\frac{1}{2}$. (d) 2
4. The integral of $6x^2$ is :
(a) $6x^3$. (b) $2x^3$.
(c) $2x^2$. (d) $6x^2$.

Turn over

5. For maximization linear programming problem, the simplex method is terminated when all the net-evaluations are :
- (a) Negative (b) Non-negative.
(c) Zero. (d) Non-positive.

(5 × 1 = 5 marks)

Part B (Very Short Answer Questions)

*Answer in one **or** two sentences each.*

*Answer any **five** questions.*

Each question carries 1 mark.

6. Define characteristic equation and characteristic roots.

7. Show that the matrix $A = \begin{bmatrix} 5 & 7 & 2 \\ 2 & 3 & 1 \\ 4 & 6 & 2 \end{bmatrix}$ is singular.

8. What do you mean by price elasticity of demand ?

9. Let $P = 100 + 10k - k^2$ be a production function where k is the input and P is the output. Find the marginal productivity when $k = 2$.

10. Find the value of $\int_2^3 x^2 dx$.

11. Find the slope of the curve at $(2, 4)$ whose equation is $y = x^3 - x^2$.

12. State the form of the general linear programming problem.

13. What do you mean by transportation problem ?

(5 × 1 = 5 marks)

Part C (Short Answer Questions)

*Answer any **six** questions.*

Each question carries 4 marks.

14. Solve the equations $2x + 3y = 1$ and $3x + y = 5$ using Crammer's rule.

15. Find the characteristic roots of the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$.
16. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ -1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2 & -1 \\ 1 & 3 & 4 \\ 0 & -2 & -3 \end{bmatrix}$, show that $AB \neq BA$.
17. Define price elasticity of supply. Find the elasticity of supply when price = 5 units if the supply function is given by $q = 25 - 4p + p^2$ where q is the supply at price p .
18. 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 the profit of the company. Also find out that profit.
19. Evaluate the following definite integrals :
- (i) $\int_0^3 (x^2 - 3x) dx$; and
- (ii) $\int_2^5 (x^2 - 4x + 5) dx$.
20. Explain the rules of differentiation.
21. A diet for a sick person must contain at least 4,000 units of vitamins, 50 units of minerals and 1,400 calories. Two foods A and B are available at a cost of Rs. 4 and Rs. 3 per unit respectively. If one unit of A contains 200 units of vitamins, 1 unit of mineral and 40 calories and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 calories. What combination of foods be used to have least cost ?

Turn over

22. Obtain an initial basic feasible solution to the following transportation problem using the north-west corner rule :

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

(6 × 4 = 24 marks)

Part D (Essay Type Questions)

*Answer any **two** questions.
Each question carries 8 marks.*

23. Solve the following system of equations by Crammer's rule :

$$2x + 3y + 4z = 20; \quad 3x + 5y + 7z = 34; \quad x + 2y + 4z = 17.$$

24. Find the characteristic equation of the matrix

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}.$$

25. 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.

26. Define Integration. What do you mean by inegration by parts ? Determine the intgral of $x^3 \log x$.

(2 × 8 = 16 marks)