

D 32816

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Name.....

Reg. No.....

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2022

(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 2×4 and another matrix B is of order 4×5 , then the product AB is of order :
(a) 2×4 . (b) 2×5 .
(c) 4×4 . (d) 4×5 .
2. The derivative of $y = 4 - 2x^3$ is :
(a) $2x^2$. (b) $-6x^2$.
(c) $4 - 6x^2$. (d) 4.
3. If R is the total revenue and x is the quantity sold, the marginal revenue is :
(a) $\frac{R}{x}$. (b) $R \times x$.
(c) $\frac{x}{R}$. (d) $\frac{dR}{dx}$.

Turn over

4. The integral of $\frac{1}{x}$ is :

(a) $\log x$.

(b) $\frac{1}{x^2}$.

(c) x .

(d) e^x .

5. While solving a transportation problem, the occurrence of degeneracy means that :

(a) Total supply equals total demand.

(b) The solution so obtained is not feasible.

(c) The few allocations become negative.

(d) None of the above.

(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. Distinguish between minors and co-factors of a matrix.

7. Define adjoint of a matrix.

8. Find the differential co-efficient of $\frac{x^3}{e^x}$.

9. Cost function of a firm is given by $C = x(x^2 - 2)$. Find the marginal cost when the production is 2 units.

10. Find the value of $\int_1^2 x^3 dx$.

11. Find the slope of the curve at $(2, 4)$ whose equation is $y = x^2 + 2x - 1$.

12. Define basic solution and basic feasible solution.
13. What is a balanced transportation problem ? What are its applications ?

(5 × 1 = 5 marks)

Part C (Short Answer Questions)

*Answer any **six** questions.
Each question carries 4 marks.*

14. Explain the properties of a determinant.

15. Find the rank of $A = \begin{bmatrix} 2 & 3 & 1 & 2 \\ 1 & 0 & 1 & 2 \\ 2 & 0 & 2 & 4 \end{bmatrix}$.

16. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 2 & -3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$, show that $A(B + C) = AB + AC$.

17. Find the derivative of :

(i) $\frac{x^2 - 1}{x^2 + 1}$; and

(ii) $\frac{x^2 + 3x + 2}{x + 5}$.

18. If $u = \frac{x^2 + y^2}{x^2 - y^2}$, show that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 0$.

19. Evaluate the following definite integrals :

(i) $\int_1^3 (x^3 + x + 6) dx$; and

(ii) $\int_1^3 (4x^3 + 6x) dx$.

Turn over

20. Find the maximum and minimum values of the function $x^3 - 18x^2 + 96x + 14$.
21. A farmer has 1,000 acres of land on which he can grow corn, wheat or soyabeans. Each acre of corn costs Rs.100 for preparation, requires 7 man-days of work and yields a profit of Rs. 30. An acre of wheat costs Rs. 120 to prepare, requires 10 man-days of work and yields a profit of Rs. 40. An acre of soyabeans costs Rs. 70 to prepare, requires 8 man-days of work and yields a profit of Rs. 20. If the farmer has Rs. 1,00,000 for preparation and can count on 8,000 man-days of work, how many acres should be allocated to each crop to maximize profits ?
22. Find the initial basic feasible solution to the following transportation problem using Vogel's Approximation Method, given the cost matrix :

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	20	25	28	31	200
S ₂	32	28	32	41	180
S ₃	18	35	24	32	110
Demand	150	40	180	170	

(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 using Crammer's rule :
- $$5x - 6y + 4z = 15 ; \quad 7x + 4y - 3z = 19 ; \quad 2x + y + 6z = 46.$$
24. Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 2 \\ 1 & 1 & 2 \end{bmatrix}$.
25. Total revenue function of a firm is given by $R = 21x - x^2$ and its total cost function is $C = \frac{1}{3}x^3 - 3x^2 - 7x + 16$, where x is the output. Find :
- The output at which the total revenue is maximum.
 - The output at which the total cost is minimum.
26. Discuss the applications of differential calculus in Economics.

(2 × 8 = 16 marks)