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Reg. No. :

Code No. : 7277

Sub. Code : ZESM 23

M.A. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Economics — Core

MATHEMATICAL METHODS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. If $A = \begin{bmatrix} 1 & 5 \\ 7 & 9 \end{bmatrix}$, A^T is

(a) $\begin{bmatrix} 1 & 7 \\ 5 & 9 \end{bmatrix}$

(b) $\begin{bmatrix} 5 & 1 \\ 9 & 7 \end{bmatrix}$

(c) $\begin{bmatrix} 5 & 1 \\ 7 & 9 \end{bmatrix}$

(d) $\begin{bmatrix} 7 & 9 \\ 1 & 5 \end{bmatrix}$

2. Rank of a matrix $A = \begin{bmatrix} 5 & 2 \\ -2 & -3 \end{bmatrix}$ is

(a) 3

(b) 2

(c) 1

(d) 0

3. If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, minor of A will be

(a) $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$

(d) $\begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix}$

4. Input-Output analysis is also known as

(a) Input-Output table

(b) Transaction matrix

(c) Inter-Industry Analysis

(d) None

5. If $y = -11x^{-9}$, find dy/dx

(a) $-99x^{-10}$

(b) $-99x^{-8}$

(c) $99x^{-8}$

(d) $99x^{-10}$

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6. If $y = 9x + 2$, dy/dx is

- (a) $9x^2 + 2x$ (b) $9x$
(c) 9 (d) 0

7. $\int_1^2 x^2 dx$ is

- (a) $9/3$ (b) $7/3$
(c) $1/3$ (d) $2/3$

8. Consumer's surplus can be calculated as

- (a) $\int_0^{x_0} P_0 x_0 - f(x) dx$ (b) $\int P_0 x_0 - f(x) dx$
(c) $\int_0^{x_0} f(x) - P_0 x_0$ (d) $\int f(x) dx - P_0 x_0$

9. Linear programming was first formulated by

- (a) Leontief (b) Kantorovich
(c) Dantzig (d) Malthus

10. The term programming refers to

- (a) planning (b) investigating
(c) deciding (d) activating

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PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) What are the types of matrix?

Or

(b) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 6 & 7 \end{bmatrix}$, verify
 $(AB)^T = B^T A^T$.

12. (a) What are the limitations of Input-Output Analysis?

Or

(b) Solve the following equations by using Cramer's rule.
 $2x_1 + 3x_2 = 13$
 $x_1 + 7x_2 = 23$

13. (a) Compute Marginal Productivity of Labour and Capital at $K = 1$ and $L = 2$ for the production function
 $X = 3KL^2 + 4K^2L + 2L + 2K$.

Or

(b) Find first and second order partial derivatives of the following function
 $z = 2x^3 + 5x^2y + xy^2 + y^2$ and also verify that
 $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$.

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[P.T.O.]



14. (a) Evaluate $\int 9x^4(x^5 + 7)^8 dx$.

Or

(b) Evaluate $\int_2^3 (x^2 + 5x + 7) dx$.

15. (a) What are the benefits of linear programming?

Or

(b) State briefly about the concept of linear programming.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Find B , if $-A + 2B = 6C$, where

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix} \text{ and } C = \begin{bmatrix} 2 & -1 & 7 \\ 3 & 0 & 0 \\ 4 & -1 & -5 \end{bmatrix}.$$

Or

(b) If $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$, verify that

$$(AB)^T = B^T A^T.$$

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17. (a) Solve the following equations by using Cramer's Rule.

$$2x_1 + 3x_2 - x_3 = 9$$

$$x_1 + x_2 + x_3 = 9$$

$$3x_1 - x_2 - x_3 = -1$$

Or

(b) In an economy of two industries A and B the data is given below in millions of rupees.

	Purchase by		Final Demand	Total Output
	A	B		
Sales by	A	12	6	24
	B	6	3	18

Determine the total output, if the final demand changes to 18 for A and 36 for B.

18. (a) If the demand function is $Q = 100 - P$ and $C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50$, find the firm's equilibrium price and output when profit is maximum.

Or

(b) Explain the application of differentiation in Economics.

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19. (a) Given the demand function $P = 8 - 2x$ and the supply function $P = 2 + x$, find the consumer's surplus and the Producer's surplus.

Or

- (b) Compute Total, Average and Average variable costs for the marginal cost function $C = 4 + 7x - 5x^2$, if the total fixed cost is 40.
20. (a) Explain the application of Linear Programming in Indian Economy.

Or

- (b) Max. $Z = 45x_1 + 80x_2$

Subject to

$$5x_1 + 20x_2 \leq 400$$

$$10x_1 + 15x_2 \leq 450$$

and $x_1 \geq 0, x_2 \geq 0$.

