(8 pages) **Reg. No. :** .....

Code No. : 7402 **Sub. Code : PESM 31**

M.A. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2020.

Third Semester

Economics – Core

MATHEMATICAL METHODS FOR ECONOMICS

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. If all the elements of a matrix is zero, the matrix is called ————.

   (a) Row matrix

   (b) Rectangular matrix

   (c) Null matrix

   (d) Column matrix

2. If $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 10 & 2 \\ 8 & 6 \end{bmatrix}$, find $A - B$

(a) $\begin{bmatrix} 9 & -3 \\ 2 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} -9 & 3 \\ -2 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} -9 & -3 \\ 2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 9 & 3 \\ -2 & -1 \end{bmatrix}$

3. Determinant of co-different matrix of $\begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$

(a) 8 (b) 88

(c) –88 (d) –8

4. In Input-output table every row explains the

(a) Output (b) Input

(c) Both (a) and (b) (d) Neither (a) nor (b)

5. If $y = x^{10}$, $\frac{dy}{dx} =$

(a) $10x^{10}$ (b) $10x^{9}$

(c) $9x^{10}$ (d) $9x^{9}$

6. First order condition of maximum is

(a) $\frac{dy}{dx} \neq 0$ (b) $\frac{d^2y}{dx^2} > 0$

(c) $\frac{dy}{dx} = 0$ (d) $\frac{d^2y}{dx^2} < 0$

7. $\int \frac{1}{x^7} dx$ is

(a) $\frac{x^6}{6} + c$ (b) $\frac{x^{-7}}{-7} + c$

(c) $\frac{x^7}{7} + c$ (d) $\frac{x^{-6}}{-6} + c$

8. $\int_1^2 x^3 \, dx$ is

(a) $\frac{15}{4}$ (b) $\frac{4}{15}$

(c) 15 (d) 4

9. The objective of the linear programming will be

(a) Maximize some numerical value

(b) Minimize some numerical value

(c) Both (a) and (b)

(d) Neither (a) nor (b)

10. If all the constraints of the given linear programming model are satisfied by the solution of the model, then that solution is known as

(a) Optimal

(b) Feasible

(c) Infeasible

(d) Alternate optimum

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Explain the properties of determinant.

Or

(b) Given $A = \begin{bmatrix} 8 & 1 & -2 \\ -9 & 9 & 9 \\ 6 & -3 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 & 3 \\ 5 & 6 & -4 \\ 7 & -9 & 8 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & -3 & 1 \\ 6 & 2 & -1 \\ 0 & -4 & 3 \end{bmatrix}$ show that $A(B + C) = AB + AC$.

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

$2x_1 + 3x_2 = 13$

$x_1 + 7x_2 = 23$

Or

(b) Solve the following pairs of simultaneous equations.

$3x + 2y = 13$

$2x + 3y = 12$

13. (a) For the total utility function $U = (x + 7)(3x + 9y)$ find marginal utilities of x and y at $x = 1$ and $y = 2$.

Or

(b) Find the elasticity of demand and MR, at $p = 2$, if the demand function $q = 30 - 5q - p^2$.

14. (a) Integrate : $\int \left(8x^3 - 3x^2 + x - 1\right) dx$.

Or

(b) Calculate the area beneath the curve $y = x^3$ between $x = 3$ and $x = 6$.

15. (a) What is linear programming and state its components?

Or

(b) What do you mean by an optimal, basic and feasible solution to a linear programming problem? Discuss with examples.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Explain the types of matrixes with examples.

Or

(b) Find the inverse of the matrix $A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & -2 & -3 \\ 3 & 1 & 1 \end{bmatrix}$.

17. (a) Solve the following set of linear simultaneous equations :

$$2x_1 + 4x_2 - x_3 = 15$$
$$x_1 - 3x_2 + 2x_3 = -5 .$$
$$6x_1 + 5x_2 + x_3 = 28$$

Or

(b) Solve the following equations by using Cramer's rule

$$2x_1 + 3x_2 = 13$$
$$x_1 + 7x_2 = 23$$.

18. (a) Consider a monopolist who faces a linear demand function $p = 100 - 2q$ and a linear total cost function $c = 50 + 2q$. Determine the optimum level of output, price, total revenue, total cost and profit, under (a) profit maximisation.

Or

(b) Investigate the maxima and minima of the function $y = 3x^4 - 10x^3 + 6x^2 + 5$.

19. (a) The demand function for a commodity $P = 25D - 20$. The supply function $P = 5D + 60$. Find the producer's surplus.

Or

(b) The demand function for a commodity $P = 30 - 2D$. The supply function $P = 3D$. Find consumer's surplus.

20. (a) Solve the following LP problem graphically

Maximize $Z = 100x_1 + 50x_2$

Subject to

$4x_1 + 6x_2 \leq 24$

$x_1 \leq 4$

$x_2 \leq \frac{4}{3}$

$x_1, x_2 \geq 0.$

Or

(b) Solve the following LP problem using graphical method.

Maximize $z = 2x_1 + 3x_2$

Subject to

$x_1 + x_2 \geq 6$

$7x_1 + x_2 \geq 14$

x_1 and $x_2 \geq 0.$

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