

2023

Time - 3 hours

Full Marks - 80

Answer all groups as per instructions.

Figures in the right hand margin indicate marks.

*Candidates are required to answer
in their own words as far as practicable.*

GROUP – A

1. Answer all questions and fill in blanks as required. [1 × 12]
- (a) A square matrix whose determinant is zero is called _____ matrix.
- (b) If $-A$ is equal to A' , then A is _____ matrix.
- (c) Inverse function is defined as _____ function.
- (d) $e^x + e^{-x}$ is an _____ function.
- (e) The value of $\lim_{x \rightarrow \frac{1}{2}} (5x) =$ _____.
- (f) An annuity that is to begin after a given number of years is known as _____.
- (g) Annuity payable for a fixed period is known as _____.

P.T.O.

[2]

(h) Linear programming deals with problems involving only a single objectives. (True or False)

(i) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is a _____ matrix.

(j) $\begin{bmatrix} 3 \\ -2 \\ 4 \end{bmatrix}$ is a _____ matrix.

(k) If $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$, then $AB =$ _____.

(l) Write the full form of GERT.

GROUP – B

2. Answer any eight of the following questions within two to three sentences each. [2 × 8

(a) What is scalar matrix ?

(b) Find the product of AB if $A = \begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$.

(c) Find the inverse of the following matrix :

$$\begin{bmatrix} 1 & -3 \\ -5 & 7 \end{bmatrix}$$

[3]

- (d) What do you mean by limit of function ?
- (e) Define Annuity certain ?
- (f) What is one one function ?
- (g) Differentiate the following function with respect to x :

$$2x^3 + 3x^2 - 6x + 4$$

- (h) What is integration by parts ?
- (i) What is the present value of a perpetuity of ₹ 30,000 at 12% per annum ?
- (j) What is transpose of a matrix ?

GROUP – C

3. Answer any eight of the following questions within 75 words each.

[3 × 8

(a) Find the adjoint of matrix $\begin{bmatrix} 5 & 6 \\ 4 & 3 \end{bmatrix}$?

(b) Give an example of odd function ?

(c) Solve for x and y, given that $\begin{bmatrix} x & y \\ 3y & x \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$.

(d) Differentiate the following function with respect to x $\frac{5-3x}{5+3x}$.

P.T.O.



[4]

- (e) Find the amount of annuity of ₹ 500 in 10 years allowing compound interest @ 5% per annum ?
- (f) Write three limitations of LPP ?
- (g) If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ show that $A^2 - 5A - 14I = 0$.
- (h) What is many one into function ?
- (i) What is rational fraction ?
- (j) Evaluate $\int \left(x + \frac{1}{x} \right) \cdot dx$.

GROUP – D

4. Answer any four of the following questions.

(a) Solve by matrix method.

[7]

$$2x + 2y + z = 13$$

$$4y + z = 17$$

$$-3x + 2y = 3$$

(b) Define a linear programming problem. Write the different types of Linear programming problem.

[7]

(c) Evaluate the following :

[7]

$$\int \frac{dx}{x(x-3)}$$

[5]

(d) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = -(a-b)(b-c)(a-c)$. [7]

(e) Distinguish between PERT and CPM and also write the usefulness of PERT and CPM. [7]

(f) A man borrows ₹ 30,000 at 6% and promises to pay off the loan in 20 annual payments beginning at the end of first year. What is the annual payment necessary? [7]

(g) Find the derivative of each of the following : [3½ × 2]

(i) $\frac{a^2 - x^2}{a^2 + x^2}$

(ii) $\frac{x^2 - 2x - 3}{x - 1}$