Instructions to Candidates: Instructions to the candidate:
1) There are 4 sections in the question paper. Write each section on separate page.
2) All Sections are compulsory.
3) Figures to the right indicate full marks.
4) Draw a well labelled diagram wherever necessary

SECTION:A

1 Choose the correct option (5M)

1) If Matrix A is of order 3×5 and Matrix B is of order 5×2, then order of AB is:
a) 3×3 b) 3×2
c) 3×5 d) 5×5

2) The following matrix of a system has :

$$\begin{bmatrix} 1 & 2 & 3 & |1 \\ 0 & 3 & 4 & |2 \\ 0 & 0 & 2 & |2 \end{bmatrix}$$

a) Trivial solution   b) infinitely many Solution
c) No solution   d)unique solution

3)Which of the following augmented matrix correspond to the given system
$a + 2b = 3$
$b + 3c = 6$
$b + c = 4$

a) $\begin{bmatrix} 1 & 2 & 0| & 3 \\ 0 & 1 & 3| & 6 \\ 0 & 1 & 1| & 4 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 2 & 0| & 3 \\ 1 & 3 & 0| & 6 \\ 1 & 1 & 0| & 4 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0| & 3 \\ 2 & 1 & 1| & 6 \\ 0 & 3 & 1| & 4 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & 2| & 3 \\ 1 & 3 & 0| & 6 \\ 0 & 1 & 1| & 4 \end{bmatrix}$

4)The set of all linear combinations of the columns of A is known as:
a) Column space of A b) Null A
c) Row Space of A d) Null Space of A^T

5) If $det(A) = 5$, then, $det(A^T) = $?
a) 2   b)-1
c) 5   d) 0

2 Very short answer questions (any 4/6)   (4M)

1) If $A = \begin{bmatrix} 3 & 5 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$, find $A - 2B + 3I$

2) Use the definition of AX and write the following vector equation as a matrix equation:
$z_1 \begin{bmatrix} 1 \\ -2 \end{bmatrix} + z_2 \begin{bmatrix} 2 \\ 3 \end{bmatrix} + z_3 \begin{bmatrix} 3 \\ 0 \end{bmatrix} + z_4 \begin{bmatrix} 3 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 13 \end{bmatrix}$

3) Define linearly independent set

4) Determine whether $T : \mathbb{R}^2 \to \mathbb{R}^2$ is a linear transformation or not:
$T(x, y) = (x^2, y^2)$

5) Let, $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$, then find $det A$ and then using property of determinants find $det(5A)$

6)Give the standard matrix of reflection through y=-x line.

<div align="center">SECTION:B</div>

3 Short answer questions (any 4/6)   (8M)

1) Let $A = \begin{bmatrix} 6 & 1 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -2 \\ 4 & 4 \end{bmatrix}$ Verify $(A + B)^T = A^T + B^T$

2) Find the reduced row echelon form of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 7 \\ 3 & 9 & 7 & 6 \end{bmatrix}$

3) Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be linear transformation such that T(X) $= AX$ find images of $u = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$ $v = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ where

$A=\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$

4)solve the following system of linear equations.

$$x - y = 3$$
$$5x + y = 2$$

5) If T is linear transformation then show that,
i) $T(c.u + d.v) = c.T(u) + d.T(v)$ where c and d are scalars
ii)$T(0) = 0$.

6) Find the determinant of $A = \begin{bmatrix} 3 & 1 & 0 \\ -2 & -4 & 3 \\ 5 & 4 & -2 \end{bmatrix}$.

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SECTION:C

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4   Short answer questions (Attempt any 4/6)   (8M)

1) Let $A=\begin{bmatrix} 1 & 1 \\ 3 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 4 & 0 \end{bmatrix}$ be two matrices show that matrix multiplication is not commutative,i.e $AB \neq BA$.

2) Determine whether matrix A is invertible or not. If yes, find its inverse. $A=\begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}$

3) Find the general solution of the linear system whose augumented matrix is

$$[A|B] = \begin{bmatrix} 1 & -4 & -5 & | & 0 \\ 0 & 1 & -1 & | & 1 \end{bmatrix}$$

.

4)Find the parametric equation of the line through a parallel to b where
$a=\begin{bmatrix} -2 \\ 0 \end{bmatrix}$ and $b=\begin{bmatrix} -5 \\ 3 \end{bmatrix}$

5)Define Subspace.
Check whether $H=\{(x,y) / y=3x + 2\}$ is a subspace of $\mathbb{R}^2$ or not ?

6) State Dimension and Rank Theorem.
Let $[A]_{3\times 5}$ be matrix having rank 2 then what will be the nullity of matrix A?

5 Attempt any two of the following (2/4)   (10M)

1) Use Cramer's rule to compute the solution of the following system.

$$x + y + 2z = 7$$
$$-x - 2y + 3z = 6$$
$$3x - 7y + 6z = 1$$

2) Let $A = \begin{bmatrix} -3 & 0 & 6 \\ -2 & 2 & 3 \\ 0 & -6 & 3 \end{bmatrix}$ and $p = \begin{bmatrix} 1 \\ 14 \\ -9 \end{bmatrix}$ Determine if vector p is in $\mathrm{Col}A$?

3)Determine if the following vectors are linearly independent or not?

$$\begin{bmatrix} 5 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 7 \\ 2 \\ -3 \end{bmatrix}, \begin{bmatrix} 9 \\ 4 \\ -4 \end{bmatrix}$$

4) Determine if vector b is linear combination of vectors a_1, a_2 and a_3.

$a_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix} a_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} a_3 = \begin{bmatrix} 5 \\ -6 \\ 8 \end{bmatrix} b = \begin{bmatrix} 2 \\ -1 \\ 6 \end{bmatrix}$