UNIT TEST

MATHEMATICS

APPLICATIONS OF MATRICES AND DETERMINANTS

MARKS: 50   **TIME 1.30 HRS**

I. CHOOSE THE BEST ANSWER: 5X1=5

1. If A is 3×3 Non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1} A^T$, then $BB^T =$

    (1)A   (2)B   (3)I $(4) B^T$

2. If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$, then $9I - A =$

    $(1) A^1$ $(2) \dfrac{A^{-1}}{2}$ $(3) 3A^1$ $(4) 2A^1$

3. If $A = \begin{bmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ then the value of a_{23} is

    (1)0   (2)-2   (3)-3   (4)-1

4. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix}$ be such that $\} A^{-1} = A$, then $\}$ is

    (1)17   (2)14   (3)19   (4)21

5. If A is a non-singular matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then $\left(A^T \right)^{-1} =$

    $(1) \begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix}$ $(2) \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$ $(3) \begin{bmatrix} -1 & -3 \\ 2 & 5 \end{bmatrix}$ $(4) \begin{bmatrix} 5 & -2 \\ 3 & -1 \end{bmatrix}$

II. ANSWER THE FOLLOWING   5X2=10

6. Show that square matrix has an inverse, then it is Unique.

7. Find the inverse (if it exists) of $\begin{bmatrix} -2 & 4 \\ 1 & -3 \end{bmatrix}$

8. Find the rank of matrix $\begin{bmatrix} 6 & 0 & -9 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ which is in row-echelon form..

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9. Find the rank of matrix $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 0 & 2 & 4 & 3 \\ 8 & 1 & 0 & 2 \end{bmatrix}$ by minor method.

10. Find the rank of matrix $\begin{bmatrix} 2 & 0 & 7 \\ 0 & 3 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ which is in row-echelon form.

III. ANSWER ANY 5 QUESTIONS: 5X3=15

11. Find the inverse of the matrix $\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$

12. Verify the property $(A^T)^{-1} = (A^{-1})^T$ with $A = \begin{bmatrix} 2 & 9 \\ 1 & 7 \end{bmatrix}$.

13. Prove that $\begin{bmatrix} \cos_{''} & -\sin_{''} \\ \sin_{''} & \cos_{''} \end{bmatrix}$ is orthogonal

14. Find the rank of $\begin{bmatrix} 4 & 3 & 1 & -2 \\ -3 & -1 & -2 & 4 \\ 6 & 7 & -1 & 2 \end{bmatrix}$

15. Solve the system of linear equation $2x + 5y = -2, x + 2y = -3$ using matrix inversion methods.

16. Solve $\dfrac{3}{x} + 2y = 12, \dfrac{2}{x} + 3y = 13$ by cramer's rule.

IV ANSWER ANY 4 QUESTIONS :   4X5=20

17. If $A = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$, find the products AB and BA and Hence solve

    $x - y + z = 4, x - 2y - 2z = 9, 2x + y + 3z = 1$

18. The prices of three commodities $A, B,$ and C are Rs x, y, and z per units respectively. A person P purchases 4 units of B and sells two units of A and 5 units of C. Person Q purchases 2 units of C and sells 3 units of A and one unit of B. Person R purchases one unit of A and sells 3 unit of B and one unit of C. In the process, $P, Q,$ and R earn Rs15,000, Rs 1,000 and Rs 4,000 respectively. Find the prices per unit of A, B ,and C . (Use matrix inversion method to solve the problem.)

19. Solve $\dfrac{3}{x} - \dfrac{4}{y} - \dfrac{2}{z} - 1 = 0, \dfrac{1}{x} + \dfrac{2}{y} + \dfrac{1}{z} - 2 = 0, \dfrac{2}{x} - \dfrac{5}{y} - \dfrac{4}{z} + 1 = 0$ by carmer's rule.

20. If $ax^2 + bx + c$ is divided by $x + 3, x - 5$ and $x - 1$, the remainders are 21, 61 and 9 respectively .Find a ,b and c .(use Gaussian elimination method).

21. Solve $x + y + z - 2 = 0, 6x - 4y + 5z - 31 = 0, 5x + 2y + 2z = 13$ by matrix inversion method.

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