SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
B.Sc.(Statistics) END SEMESTER EXAMINATIONS NOVEMBER - 2023
SEMESTER - II
20USTCT2004 - Matrix Algebra

Total Duration : 2 Hrs 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Explain the properties of Matrix multiplication.
2. Show that A $= \begin{pmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{pmatrix}$ is a Nilpotent of Index 3
3. Find the rank of the matrix A $= \begin{pmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ -1 & -3 & -4 & -3 \end{pmatrix}$
4. If A$= \begin{pmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$ Find A^2 and show that $A^2 = A^{-1}$
5. Examine the consistency and hence solve the equations:
   x + y + 4z = 6; 3x + 2y - 2z = 9 ; 5x + y + 2z = 13
6. Find the characteristic roots and characteristic vectors of A $= \begin{bmatrix} 8 & 6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$
7. Prove that a square matrix A and its transpose A' have the same characteristic roots.
8. Illustrate Definiteness of a 2 variable quadratic form.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Prove that A $= \begin{pmatrix} (1+i)/2 & (-1+i)/2 \\ (1+i)/2 & (1-i)/2 \end{pmatrix}$ is unitary.
10. Find the rank of the matrix A $= \begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 1 \end{bmatrix}$

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11. Show that the equations $x + y + z = 6$; $x + 2y + 3z = 14$; $x + 4y + 7z = 30$ are consistent and solve them.
12. Solve the quadratic equation $3x^2 + 6x + 2 = 0$ using quadratic formula.
13. Using Cayley Hamilton theorem, compute the inverse of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 3 & 2 \\ 1 & 0 & 1 \end{bmatrix}$

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