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 APRIL - 2024
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. Prove a necessary and sufficient condition for a matrix A to be a symmetric is that A and A' are equal.
2. If A be an $n \times n$ matrix, prove that $|adj\ A| = |A|^{n-1}$.
3. Prove that the characteristic roots of a Hermitian matrix are real.
4. Show that the relation of congruence of matrices is an equivalence relation in the set of all $n \times n$ matrices over a field F.
5. If $AB = A$ and $BA = B$ then $B^{'}A^{'} = A'$ and $A^{'}B^{'} = B^{'}$ and hence prove that A' and B' are idempotent.
6. Show that if A be an n- rowed non-singular matrix, X be an $n \times 1$matrix, B be an $n \times 1$ matrix, the system of equations $AX = B$ has a unique solution.
7. If A and B are two square matrices of the same order, then prove that AB and BA have the same characteristic roots.
8. Write short notes on the signature and index of a real quadratic form.

Section C

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

9. Prove that every Hermitian matrix A can be written as $A = B + iC$ where B is real and symmetric and C is real and skew-symmetric.
10. Show that every $m \times n$ matrix of rank r can be reduced to the form $\begin{pmatrix} I_r & O \\ O & O \end{pmatrix}$ be a finite chain of E- operations, where I_r, is the r- rowed unit matrix.
11. Prove that the system of equations $AX = B$ is consistent i.e. possesses a solution, if and only if the coefficient matrix A and the augmented matrix $\begin{bmatrix} A & B \end{bmatrix}$ are of the same rank.

12. State and prove the Cayley-Hamilton theorem.
13. To prove that the number of positive terms in any two normal reductions of a real quadratic form is the same.

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