



A Charutar Vidya Mandal's Institution
V. P. & R. P. T. P. SCIENCE COLLEGE

(AUTONOMUS) (Grant-in-Aid)

Affiliated to Sardar Patel University

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Bachelor of Science (Semester 2) External Examination-2024

US02IDMTH01:Basics of Matrices

Date: 10-04-2025, (Thursday)

Time: 2:00 pm to 3:30 pm

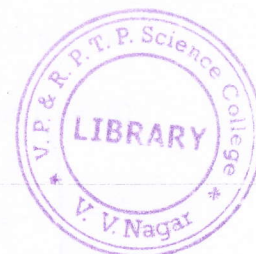
Total marks: 25

NOTE: The symbols used in this paper have usual meaning unless specified.

Q. 1 Write the most appropriate answer from the following multiple-choice questions.

[05]

- (1) Diagonal elements of skew Hermitian matrix are
(a) Real (b) Zero or purely imaginary (c) Complex (d) None
- (2) For any square matrix A , the matrix $A + A'$ is a matrix.
(a) Symmetric (b) skew-Symmetric (c) skew-hermitian (d) hermitian
- (3) Constant term of Characteristics polynomial of matrix A represent.....
(a) $|A|$ (b) A^{-1} (c) I (d) None
- (4) A system of m non-homogeneous linear equations $AX = B$ in n unknowns is consistent if.....
(a) $m = n$ (b) $m \neq n$ (c) $\text{rank } A \neq \text{rank } [A, B]$ (d) $\text{rank } A = \text{rank } [A, B]$
- (5) A Square matrix A is said to be idempotent if.....
(a) $A^2 = A$ (b) $A^2 = I$ (c) $A^3 = A$ (d) $A^2 = \text{zero matrix}$



Q. 2 (A) Determine the rank of the following matrix by reducing it to row-echelon form.

$$A = \begin{pmatrix} 1 & 3 & 2 & 0 \\ 2 & 0 & 1 & 1 \\ 1 & 2 & 3 & 0 \\ 3 & -1 & 0 & 1 \end{pmatrix}$$

[07]

(B) Using minor of a matrix find the rank of the following matrix.

$$B = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ -2 & -3 & -1 \end{pmatrix}$$

[03]

OR

Q. 2 (P) (i) Show that every square matrix can be expressed uniquely as the sum of symmetric and skew-symmetric matrix.

(ii) Prove that if A and B are idempotent matrices then AB is idempotent if A and B commute. [04]

(Q) Find inverse of the following matrix using elementary row operations, if exists.

$$Q = \begin{pmatrix} -1 & 0 & -2 & 1 \\ -2 & 1 & 0 & 1 \\ 1 & 0 & 2 & -1 \\ -4 & 1 & -3 & 1 \end{pmatrix} \quad [06]$$

Q. 3 (A) Solve the following system of equations by using Gauss Jordan elimination method. [05]

$$x + y + z = 6;$$

$$x + 2y + 3z = 14;$$

$$2x + 4y + 7z = 30$$

(B) Find the Characteristic roots and Any one Characteristic vector of the following matrix: [05]

$$X = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

OR

Q. 3 (P) Verify the Cayley- Hamilton theorem for the following matrix

$$P = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \\ -2 & 1 & 4 \end{pmatrix}$$

(Q) Solve the following systems of equations by using Crammer's theorem if it exists.

$$x + 2y + 3z = 14;$$

$$3x + y + 2z = 11;$$

$$2x + 3y + z = 11$$

[05]

ALL THE BEST

