

B.Sc. Semester - 1 (NEP-2020) Examination

OCT/NOV-2024

MAT: Matrices and Coordinate Geometry (Multidisciplinary Course)

Time: 2:00 Hours

Marks: 50

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que.1(A) Answer any one question out of two. (05)

- (1) Show that matrix multiplication is Associative.
- (2) Define Echelon form of a matrix and convert matrix

$$A = \begin{bmatrix} 1 & 3 & -3 & -1 & -4 \\ 1 & 4 & 1 & -2 & -2 \\ 2 & 9 & 0 & -5 & -2 \end{bmatrix} \text{ in to echelon form.}$$

Que.1(B) Answer any one question out of two. (05)

- (1) if A is n-square matrix then prove that $A(\text{adj } A) = |A|I$

- (2) Define Period of matrix and find period of matrix $\begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$

Que.2(A) Answer any one question out of two. (05)

- (1) Prove that the row rank of a matrix is equal to its column rank.

- (2) Find rank of matrix $B = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ using echelon form.

Que.2(B) Answer any one question out of two. (05)

- (1) Show that rank of any matrix $\geq$ rank of its every sub matrix.
- (2) Define normal form of a matrix and find rank of matrix

$$B = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix} \text{ by represent it to Normal form.}$$

Que.3(A) Answer any one question out of two. (05)

- (1) Show that the equation $AX=O$ has a non zero solution iff A is singular.

- (2) Find inverse of matrix $C = \begin{bmatrix} -1 & 2 & -3 \\ 2 & 1 & 0 \\ 4 & -2 & 5 \end{bmatrix}$ using Cayley-Hamilton theorem.

Que.3(B) Answer any one question out of two. (05)

- (1) Show that there is more than one Eigen vectors with respect to any Eigen Value of given matrix.
- (2) Solve following Linear equations :

$$2x+y-4z = 0$$

$$3x+5y-7z = 0$$

$$4x-5y-6z = 0$$

Que.4(A) Answer any one question out of two. (05)

- (1) Show that $(0,0), (3, \frac{\pi}{2})$ and $(3, \frac{\pi}{6})$ are vertices of equilateral triangle.
- (2) Derive relation between Cartesian co-ordinates and spherical co-ordinates.

Que.4(B) Answer any one question out of two. (05)

(1) In usual notation derive the equation of a conic in polar co-ordinates

$$\frac{l}{r} = 1 + e \cos \theta.$$

(2) Find the polar equation of the circle whose diameter has extremities

$$(2,0) \text{ and } (3, \frac{\pi}{2}).$$

Que.5(A) Answer any one question out of two. (05)

(1) if $C = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $C^n = \begin{bmatrix} 1 + 2n & -4n \\ n & 1 - 2n \end{bmatrix}$ Where $n \in \mathbb{N}$.

(2) Find Eigen values and Eigen vectors of matrix $D = \begin{bmatrix} -3 & -6 & 7 \\ 1 & 1 & -1 \\ -4 & -6 & 8 \end{bmatrix}$

Que.5(B) Answer any one question out of two. (05)

(1) Solve following linear equations if possible :

$$3x - 5y + 2z + 4w = 2$$

$$7x - 4y + z + 3w = 5$$

$$5x + 7y - 4z - 6w = 3$$

(2) Find the polar equation of the straight line passing through $(2, \pi)$ and $(1, \frac{\pi}{2})$.
