647510 **BSCmaMN201x-1C** **Seat No :________**

# B.Sc. Semester – 1 (NEP-2020) Examination
# January-2024
# Matrices and Coordinate Geometry (Minor)

**Time: 2:00 Hours** **Marks: 50**

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

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Que.1(A) Answer any one.
(1) Define: Diagonal Matrix, Trace of Matrix, Scalar Matrix, Nilpotent Matrix, Idempotent Matrix. (05)
(2) Prove that every square matrix can be expressed uniquely as the sum of a symmetric and skew symmetric Matrix. (05)

Que.1(B) Answer any one.
(1) In usual notation prove that matrix multiplication is associative. (05)
(2) Let $A=[a_{ij}]$ be nxn Matrix then prove that A (adj A) = |A| I. (05)

Que.2(A) Answer any one.
(1) Find rank of matrix $\begin{bmatrix} 3 & 1 & 4 & 0 \\ 0 & 2 & 2 & 0 \\ 1 & -1 & 0 & 0 \end{bmatrix}$ using definition of linearly independence. (05)
(2) Prove that the raw rank of a matrix is the same as its rank. (05)

Que.2(B) Answer any one.
(1) Prove that rank of product of two matrices cannot exceed the rank of either matrix. (05)
(2) Find rank of matrix $\begin{bmatrix} 3 & 1 & 4 & 0 \\ 0 & 2 & 2 & 0 \\ 1 & -1 & 0 & 0 \end{bmatrix}$ using echelon form. (05)

Que.3(A) Answer any one.
(1) State and prove Cayley- Hamilton theorem. (05)
(2) Find eigen values and eigen vectors of Matrix A= $\begin{bmatrix} -3 & -6 & 7 \\ 1 & 1 & -1 \\ -4 & -6 & 8 \end{bmatrix}$. (05)

Que.3(B) Answer any one.
(1) Solve the linear equations: 2x-y+3z=9, x+y+z=6, x-y+z=2. (05)
(2) Using Cayley- Hamilton theorem find inverse of $\begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$. (05)

Que.4(A) Answer any one.
(1) In usual notation derive the equation of a conic in polar coordinate $l/r=1+e\cos\theta$. (05)
(2) Derive formula to find distance between two points in polar coordinates. (05)

Que.4(B) Answer any one.
(1) Obtain the equation of circle where centre is (p, α) and radius α. (05)
(2) Find Cartesian coordinates for the polar coordinates (2, π/3) and $(-\sqrt{2}, -\frac{\pi}{4})$ (05)

Que.5(A) Answer any one.

(1) In usual notation prove that adj(AB)= adj(B) adj(A) (05)

(2) Find echelon form of matrix $\begin{bmatrix} 1 & 0 & -4 \\ 0 & -1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$. (05)

Que.5(B) Answer any one.

(1) If A= $\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^n$= $\begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ where n $\epsilon$ N. (05)

(2) Find area of triangle with vertices $(-3,30^0)$, $(5,150^0)$, $(7,210^0)$. (05)

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