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

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

OCT/NOV-2024

MAT: Matrices and Coordinate Geometry (Minor)

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 out of TWO. **(05)**

(1) Define: Periodic Matrix, Idempotent Matrix, Involutory Matrix, Unitory Matrix, Hermitian Matrix.

(2) In usual notation prove that Matrix multiplication is Associative.

Que.1(B) Answer any ONE out of TWO. **(05)**

(1) For $A=[a_{ij}]$ nxn Matrix, prove that A (adj A) = |A| I

(2) Prove that every square Matrix can be expressed uniquely as the sum of a symmetric and skew symmetric Matrix.

Que.2(A) Answer any ONE out of TWO. **(05)**

(1) Define Rank of Matrix using linearly independent rows or columns of Matrix. Using this definition find Rank of Matrix A= $\begin{bmatrix} 3 & 1 & 4 & 0 \\ 0 & 2 & 2 & 0 \\ 1 & -1 & 0 & 0 \end{bmatrix}$

(2) Prove that the raw rank of a Matrix is the same as its rank.

Que.2(B) Answer any ONE out of TWO. **(05)**

(1) Define normal form of a matrix. Find Rank of Matrix A= $\begin{bmatrix} 3 & 1 & 4 & 0 \\ 0 & 2 & 2 & 0 \\ 1 & -1 & 0 & 0 \end{bmatrix}$ by represent it to normal form.

(2) Prove that rank of product of two Matrices cannot exceed the rank of either Matrix.

Que.3(A) Answer any ONE out of TWO. **(05)**

(1) State and prove Cayley- Hamilton theorem.

(2) Prove that there is a unique eigen value with respect to any eigen vector of given matrix.

Que.3(B) Answer any ONE out of TWO. **(05)**

(1) Show that the equation AX=0 has a nonzero solution iff A is singular.

(2) Solve the linear equations: x+y+z=9, 2x+5y+7z=52, 2x+y-z=0.

Que.4(A) Answer any ONE out of TWO. **(05)**

(1) Derive relation between Cartesian coordinates and polar coordinates. Also find Cartesian coordinates of (2, 2π/3).

(2) Derive formula to find distance between two points in polar coordinates. Also find the distance between (a, π/2) and (3a, π/6).

Que.4(B) Answer any ONE out of TWO. **(05)**

(1) Obtain the equation of circle where centre is (p,α) and radius α.

(2) Obtain the equation of line passing through (1, π) and (2, π/2).

Que.5(A) Answer any ONE out of TWO. **(05)**

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

(2) If matrix $\begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal then find value of l, m, n.

Que.5(B) Answer any ONE out of TWO. **(05)**

(1) Find eigen values and eigen vectors of A= $\begin{bmatrix} \text{Cos}\theta & \text{Sin}\theta \\ -\text{Sin}\theta & \text{Cos}\theta \end{bmatrix}$

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

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