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Total No. of Questions : 09

B.Sc. (Non Medical) (Sem.–4)

LINEAR ALGEBRA

Subject Code : BSNM-406-18

M.Code : 77684

Date of Examination : 13-07-22

Time : 3 Hrs. **Max. Marks : 50**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Check whether set of vectors are linearly independent (1, 3, 2), (1, –7, –8) , (2, 1, –1).

b) Check whether T is linear transformation $T : R^2 \to R^3$ defined by

$$T(x, y, z) = (x + 1, 2y, x + y)$$

c) For what value of K will the vector $V = (1, K, -4) \in V_3(R)$ is linear combination of $V_1 = (1, -3, 2)$ and $V_2 = (2, -1, 1)$

d) Find rank of the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 3 & 2 & 4 \\ -1 & 3 & 2 \end{bmatrix}$

e) Define Echlon form of a matrix

f) State Rank Nullity theorem.

g) Find eigen values and eigen vectors of matrix $\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$.Check whether W is subspace of V.

h) V is set of all 3*1 real matrices with usual addition & scalar multiplication & W consisting of all 3*1 real matrices of form $\begin{bmatrix} a \\ b \\ 2 \end{bmatrix}$. Check whether W is subspace of V.

i) If A and B are Hermitian matrices. Show that AB is Hermitian iff AB = BA.

j) Show characteristic roots of A^{θ} are conjugate of characteristic roots of A.

SECTION-B

2. Let T: $R^2 \to R^2$ be linear operator defined by $T(x, y) = (4x - 2y, 2x + y)$. Find matrix of T relative to basis = {(1, 1), (–1, 0)}.

3. Write linear transformation corresponding to $A = \begin{bmatrix} 2 & 0 & 3 \\ -5 & 1 & 6 \\ 4 & -7 & 8 \end{bmatrix}$.

4. Examine whether following set form basis (1,1,1) , (1,2,3), (–1,0,1).

5. Examine consistency of equation $x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2$, $x - y + z = -1$. If consistent, find complete solution.

6. Let V be a vector space & $T : \upsilon \to V$ is linear transformation. Show that

   $R(T) \cap N(T) = \{0\}$ iff for all $\upsilon \in V$, $T(T(\upsilon)) = 0$ implies $T(\upsilon) = 0$.

SECTION-C

7. Prove that union of two subspaces is a subspace iff one is subset of other.

8. a) Find basis & dimension of range space & null space for $T : R^3 \to R^3$ defined by

   $T(x, y, z) = (x + 2y, y - z, x + 2z)$

   b) Find inverse of matrix $\begin{bmatrix} 1 & 2 & 1 \\ 3 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$ by using row transformation.

9. State and Prove Cayley Hamilton theorem.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.