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SEAT No. :

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F.Y.B.Sc.

COMPUTER SCIENCE

Mathematics

MTC-121: Linear Algebra

(2019 Pattern) (Semester -II)

[Time : 2 Hours] *[Max. Marks : 35]*

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of single memory, non-programmable scientific calculator is allowed.*

Q1) Attempt any five of the following. **[10]**

a) Define subspace of a vector space. Give one example of subspace of a Vector space R^2.

b) Write the standard basis for $P_2(\mathbb{R})$. Also write it's dimension

c) Is the transformation $T: \mathbb{R}^2 \to \mathbb{R}^3$ defined by $T(x,y) = (x^2, y^2, xy)$ is linear? Justify.

d) Define the following terms:

i) Affine dependence

ii) Affine independence

e) Write matrix for the following quadratic forms

$q(x)=4x^2+5xy-7y^2$

f) Find eigen values of $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

g) Find nullity of a matrix A of order 4x5 & rank(A)=3.

P.T.O.

Q2) Attempt any three of the following. **[15]**

a) Prove that Intersection of two subspace of a vector space is again a subspace.

b) Find rank of following matrix A and hence write it's nullity.

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

c) Find all eigen values & eigen vectors of the following matrix.

$$A=\begin{bmatrix}-2 & 0 & 1\\ -6 & -2 & 0\\ 19 & 5 & -4\end{bmatrix}$$

d) Find quadratic form of $A=\begin{bmatrix}5 & -3\\ -3 & 7\end{bmatrix}$

e) Which of the following sets are Linearly Independent?

$V=R^4$ with usual operations $s=\{v_1,v_2,v_3\}$ where $v_1=(2,-1,0,2)$

$v_2=(1,2,5,-2)$ $v_3=(7,-1,5,8)$

Q3) Attempt any one of the following. **[10]**

a) Determine whether the given matrix A is diagonalizable. If so find matrix P that diagonalize $A=\begin{bmatrix}7 & 2\\ 0 & 8\end{bmatrix}$

b) i) Let $T:R^2\rightarrow R^2$ be a linear transformation $s=\{v_1,v_2,v_3\}$ be abasis for R^3.

Where, $V_1=(1,1,1)$ $v_2=(1,1,0)$ $v_3=(1,0,0)$

Also, $T(v_1)=(1,0)$, $T(V_2)=(2,-1)$,$T(V_3)=(4,3)$.Find T(W)?

Where,W=(-1,5,2)

ii) Let T: $R^3\rightarrow R^3$ is defined by T(x,y,z) = (x+y+z ,2x-3y+4z) then show that T is Linear Transformation.

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