VCD 9/10/19 SYCS / SEM-IV(Choice Based) LINEAR ALGEBRA

Marks:75

2½ Hours

Instructions: **1) All questions are compulsory.**
2) Figures to right Indicate full marks.
3) Illustrations, in-depth answers and diagram will be appreciated.

Q.1 Attempt all (5marks each) **(15)**

A) Multiple choice questions.

i) Which of the following commands will create a list?

a) list1=list() b) list1=[] c) list1=([1,2,3]) d) All of these.

ii) The dot product of (1,3,1) & (0,1,-1) is_____

a) 2 b) -2 c) 1 d) None of these.

iii) The dot product of (0,1,4) & (1,2,3) is _____

a) -10 b) 10 c)12 d) None of these.

iv) A vector whose norm is called_____

a) Null b) basis c) Unit d) None of these.

v) For any homogenous system _____ is a trivial solution

a) zero b) nonzero c) one d) None of these.

B) Fill in the blanks

i) The output when we execute list ("Hello") is _____

ii) If diagonal entry of squire matrix is one & non-diagonal entry is zero then matrix is called._____

iii) To add a new element to a list we use _____ command.

iv) The absolute value of Hui is _____

v) Inverse of a matrix is _____

C) Answer the following question.

1) Define dot product

2) Define dimension

3) Find dot product of (1,5), (4,-2)

4) Solve (1.1) + (0.1) + (0.1)

5) Determine the term characteric equation.

Q.2 Attempt the following (Any Three) **(15)**

a) Find the squire root of complex number 7-4i

b) Determine whether v_1 =(2,1,2), v_2 =(0,1,3), v_3 =(1,1,1) span vector space R^3

c) Write a python program to find conjugate of complex number.

d) Are the following vectors are linearly dependant ?

v_1=(3,1,3), v_2=(2,4,6), v_3=(1,-1,6)

e) Express in polar and exponential form $1-i\sqrt{3}$

f) Check whether the set of all pairs of real numbers of the form $(1, x)$ with operation $(1, y) + (1, y') = (1, y + y')$ and $k(1, y) = (1, ky)$ is a vector space.

Q.3 Attempt the following (Any Three) **(15)**

a) Find the angle between the two vectors $a = (2,3,4), b = (1, -4,3)$ in IR^3

b) Find null space in matriX $\begin{bmatrix} 1 & 3 & 1 \\ 2 & 4 & 3 \\ 1 & 1 & 2 \end{bmatrix}$

c) Let $f: U \to V$ be linear transformation then show that $kerf = \{0\}$ iff f is injective.

d) Consider subspace $U_1 = \{(x, y, w, z)/x - y = 0\}$ and $U_2 = \{(x, y, w, z): x = w_1 y=z$ find basic & determination of i) U_1 ii)U_2 iii)$U_1 \cap V_2$

e) Check whether the set of functions are linearly independent $2 - x + 4x^2$,$3 + 6x + 2x^2$, $2flox - 4x^2$

f) If V, W are two subsets of a vector space V such that U is a subset of W then show that W^0 is a subset of U^0 where U^0 ,W^0, are annihilator of U,W respectively.

Q.4 Attempt the following (Any Three) **(15)**

a) Find orthonormal basis for subspace IR^4 whose generators are v_1=(1,1,1,1), v_2=(1,2,4,5), v_3=(4-3,-4,-2)

b) Let a=(3,0),b=(2,1) find vector is span {a} that is closed to b is b''^a and distance $\| b \perp a \|$

c) Find inner product, angle, orthogonality for $p = -5 + 2x - x^2$,q= $2 + 3x^2$

d) Write program in python to find g.c.d(240,36)

e) Let u,v be orthogonal vectors then prove that scaler a,b $\| au + by \|^2 = a^2 \| u \|^2 + b^2 \| v \|^2$

f) Explain internet worm.

Q.5 Attempt any three of following. **(15)**

a) Let T=$IR^3 \rightarrow IR^2$ be linear map be defined by $f(x,y,z) = (x + 2y - z, x + y - 2z)$ verify (Rank T +Nulity T=3).

b) Find eigen values & eigen vectors of $\begin{bmatrix} 3 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & -1 & 3 \end{bmatrix}$

c) Let S be a subset of vector space V. prove that S$\perp$ is a subspace of V.

d) Express the following as linear combination of V_1=(-2,1,3) V_2=(3,1,-1) , V_3=(-1,-2,1) with w=(6,-1,5).

e) Fill the table vector

space	basic	dimension
{0}	_____	_____
IR^2	{(1,0),(0,1)}	_____
$P_2(x)$	_____	3
$M_2(IR)$	_____	4
IR	{1}	_____