Hall Ticket Number:

Code No. : 13145 S (F)

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. III-Semester Supplementary Examinations, August-2022

Linear Algebra and its Applications (OE-I)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Subspace of a Vector Space.	2	1	1	1,12
2.	Find the coordinates of the vector $\begin{bmatrix}1\\5\end{bmatrix}$ relative to the ordered basis $B=\left\{\begin{bmatrix}1\\1\end{bmatrix},\begin{bmatrix}-1\\1\end{bmatrix}\right\}$.	2	3	1	1,12
3.	*Let* $T:R^2\to R^2$ *by* $T\left(\begin{bmatrix}x\\y\end{bmatrix}\right)=\begin{bmatrix}e^x\\e^y\end{bmatrix}$ *is T a Linear Transformation ? justify your answer.*	2	2	2	1,12
4.	Let V and W be vector spaces, and *Let* $T:V\to W$ be a linear transformation. Then show that $T(0)=0$	2	1	2	1,12
5.	State Rank Nullity theorem.	2	1	3	1,12
6.	Define Inverse of a Linear Transformation.	2	1	3	1,12
7.	Find the angle between the two vectors $u=\begin{bmatrix}2\\-2\\3\end{bmatrix}$ and $v=\begin{bmatrix}-1\\2\\2\end{bmatrix}$.	2	2	4	1,12
8.	Define Inner Product space.	2	1	4	1,12
9.	Write the ordered Basis for vector space V a) V = $P_n(x)$ b) V = set of all matrices of order 2X2.	2	1	1	1,12
10.	*Let* $T:P_3\to P_2$ *is a Linear Transformation* Defined by $T(p(x))=\frac{d}{dx}p(x)$. Describe the polynomials in P_3 that are mapped to the zero vectors in P_2.	2	2	2	1,12
	Part-B (5×8 = 40 Marks)				
11. a)	Write all the 10 axioms of a vector space over the field **F.**	5	2	1	1,12
b)	If $B=\{2x^2+x+2,\ 1,\ -x^2+x\}$. Determine whether B is a Basis for $P_2(x)$ or not.	3	3	1	1,12

Contd... 2

12. a)	$T: R^3 \to R^2$ *defined by* $T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} 3x - 2y + z \\ x - 3y - 2z \end{bmatrix}$, Verify that T is linear transformation or not.	4	2	2	1,12
b)	*Let* $T: P_2 \to P_2$ *is a Linear operator and* $T(1) = 1 + x$, $T(x) = 2 + x^2$, $T(x^2) = x - 3x^2$, *then find* $T(-3 + x - x^2)$	4	3	2	1,12
13.	$T: R^3 \to R^2$ *be a Linear Transformation defined by* $T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} 5x + 2y - 4z \\ x - 5y + 3z \end{bmatrix}$. $B_1 = \left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \right\}$ & $B_2 = \left\{ \begin{bmatrix} 1 \\ 3 \end{bmatrix}, \begin{bmatrix} 2 \\ 5 \end{bmatrix}, \right\}$ are ordered basis for R^3 and R^2 respectively. Find the matrix of a linear transformation relative to the ordered basis B_1 & B_2 .Also find the image of $v = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ directly and verify with matrix of a linear transformation.	8	4	3	1,12
14.	Let $B = \left\{ \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}, \right\}$ is a basis for R^3, Apply Gram-Schmidt process to B to find orthonormal basis for R^3 with respect to standard inner product.	8	3	4	1,12
15. a)	If $S = \left\{ \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ -1 \\ 1 \end{bmatrix}, \right\}$ Determine whether the vector $v = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ is in Span(S) or not ?	4	3	1	1,12
b)	*Let* $T: P_3 \to R^2$ *is a Linear Transformation* Defined by $T(ax^3 + bx^2 + cx + d) = \begin{bmatrix} -a - b + 1 \\ c + d \end{bmatrix}$. Let $u = -x^3 + 2x^2 - x + 1$, $v = x^2 - 1$ then Find a)T(u) and T(v) b) Is T(u+v) = T(u)+T(v) ?	4	3	2	1,12
16. a)	*Let* $T: R^2 \to R^2$ *is a Linear Transformation by* $T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} -x + y \\ x + y \end{bmatrix}$ Then find the basis for R (T) and N(T) .	4	3	3	1,12

			M	L	CO	PO
	b)	Let V = P_2 with inner product defined by $\langle p, q \rangle = \int_{-1}^{1} p(x).q(x)dx$. If $p(x) = x$ *and* $q(x) = x^2 - x + 1$ then find cosine angle between $p(x)$ & $q(x)$	4	2	4	1,12
17.		Answer any ***two*** of the following:				
	a)	If $S = \left\{ \begin{bmatrix} 2 \\ -3 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 2 \end{bmatrix}, \begin{bmatrix} -1 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix} \right\}$ Find the basis for the Span(S) as a subspace of R^3	4	3	1	1,12
	b)	Let V and W be vector spaces, and *Let* $S, T : V \to W$ be a linear transformation. The function $S + T : V \to W$ *defined by* $(S+T)v = S(v) + T(v)$ Then prove that $S+T$ is Linear Transformation.	4	2	2	1,12
	c)	*Let* $T : R^2 \to R^2$ *is a Linear Transformation by* $T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} 3x - y \\ x + y \end{bmatrix}$ find T^{-1}.	4	3	3	1,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1 & 2	61%
ii)	Blooms Taxonomy Level – 3 & 4	39%

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