D.Y.PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
KASABA BAWADA KOLHAPUR-416006
(An Autonomous Institute)
S. Y. B. Tech. (Semester-III)
END SEMESTER EXAMINATION, OCT./NOV..- 2021-22
COURSE NAME: Linear Algebra **COURSE CODE:** 201AIMLL201

Q. Paper Code:

Set-: I

Day and Date: …….day, …/…/2022
Time: ----- to ------

Seat No :

Max. Marks- 50

OBJECTIVE

Instructions:

1) Each question carries **2 marks**.

2) **Non Programmable** Calculator is allowed.

Q. No.			Correct Option
Q. 1)	Let V be a vector space and $S = \{v_1, v_2, v_3, ..., v_n\}$ be non-empty set of vectors in V. If there exist scalars $k_1, k_2, k_3, ..., k_n$ all are zero such that $k_1 v_1 + k_2 v_2 + k_3 v_3 + ... + k_n v_n = 0$ then the set S is called as		A
	A) Linearly independent set in V.	B) Linearly dependent set in V.	
	C) Both linearly independent set in V, as well as linearly dependent set in V.	D) None of these	
Q. 2)	The dimension of R^2 vector space is		B
	A) 1	B) 2	
	C) 3	D) 4	
Q.3)	Let W be subspace of vector space V, then which of the following statement is true		A
	A) 1. $W \neq 0$ 2. If u and v are vector in W, then $u + v$ is in W. 3. If k is a scalar and u is a vector in W, then ku is in W.	B) 1. $W \neq 0$ 2. If u and v are vector in W, then $u + v$ is not in W. 3. If k is a scalar and u is a vector in W, then ku is in W.	
	C) 1. $W = 0$ 2. If u and v are vector in W, then $u + v$ is in W. 3. If k is a scalar and u is a vector in W, then ku is in W.	D) 1. $W \neq 0$ 2. If u and v are vector in W, then $u + v$ is not in W. 3. If k is a scalar and u is a vector in W, then ku is not in W.	
Q. 4)	If A is any matrix, then the relation between dimension of the row space of A and column space of A is		C
	A) May be same or may not be same	B) The different dimension.	
	C) The same dimension.	D)None of these	
Q. 5)	If A is a matrix with n columns, then Rank (A) + Nullity (A) is equal to		D
	A) 0	B) 1	
	C) infinite	D) n	

Q. 6)	Calculate the nullity of the matrix A, if A matrix is of order 3*4 and rank (A) =2		C
	A) 1	B) 3	
	C) 2	D) 4	
Q. 7)	If a matrix is in row echelon form, then the column vectors that contain the leading 1's form a basis for		A
	A) The column space of that matrix	B) The row space of that matrix	
	C) Normal form	D)None of these	
Q. 8)	If a set contains zero vectors, then S is		C
	A) Linearly independent	B) Both linearly dependent as well as independent	
	C) Linearly dependent	D) None	
Q. 9)	The cosine angle between the vectors $u =(-1,2,3,4)$ and $v=(4,1,2,1)$ is		B
	A) $\dfrac{4}{\sqrt{8}\sqrt{9}}$	B) $\dfrac{8}{\sqrt{30}\sqrt{22}}$	
	C) $\dfrac{1}{\sqrt{30}\sqrt{22}}$	D) $\dfrac{8}{\sqrt{30}}$	
Q. 10)	If a set of vector is linearly dependent then		
	A) Exactly one member can be expresses as linear combination of the remaining vectors	B) At least one member can be expresses as linear combination of the remaining vectors	
	C) No member can be expresses as linear combination of the remaining vectors	D) None of these	B
Q. 11)	The Euclidean inner product of the vector $u =(-1,2,3,5)$ and $v=(3,-2,0,4)$ in R^4 is		D
	A) 10	B) 11	
	C) 12	D)13	
Q.12)	Calculate the distance between $u =(1,1,-1)$ and $v=(-1,1,0)$ in R^3 with Euclidean inner product		A
	A) $\sqrt{5}$	B) $\sqrt{4}$	
	C) $\sqrt{3}$	D) $\sqrt{6}$	
Q. 13)	If u and v are orthogonal vectors in an inner product space, then generalized theorem of Pythagoras is		A
	A) $\|u+v\|^2 = \|u\|^2 + \|v\|^2$	B) $\|u+v\|^2 \neq \|u\|^2 + \|v\|^2$	
	C) $\|u+v\|^2 < \|u\|^2 + \|v\|^2$	D) $\|u+v\|^2 > \|u\|^2 + \|v\|^2$	
Q. 14)	If $u =(1,4,3,2)$ and $v=(3,0,8,-2)$ are the vectors in R^4, Then $\|u+v\|$ is		C
	A) $\sqrt{77}$	B) $\sqrt{45}+\sqrt{77}$	
	C) $\sqrt{153}$	D) $\sqrt{30}$	

Q. 15)	If $u = (1,2,3)$ and $v = (4,2,1)$. Evaluate $< 2u - 3v, 2u + v >$		D
	A) -95	B) -99	
	C) -97	D) -93	
Q. 16)	In a fuzzy set $A = \left\{ \dfrac{0.1}{x} + \dfrac{0.85}{y} + \dfrac{0.91}{z} + \dfrac{0.9}{u} + \dfrac{0.24}{v} + \dfrac{0.3}{w} \right\}$ The values 0.1, 0.85, 0.91, 0.9, 0.24, 0.3 are known as		B
	A) Membership grads of crisp set A	B) Membership grads of fuzzy set A	
	C) Subset of fuzzy set A	D) None of these	
Q. 17)	Fuzzy sets A and B given by $A(x)\dfrac{x}{x+1}$, $B(x) = 1 - \dfrac{x}{10}$ $X = \{0,1,2,3,...,10\}$ If $|A| = 7.98$, $|B| = 5.5$, $|A \cap B| = 3.97$ Evaluate $S(A,B)$		C
	A) 0.7222	B) 7.98	
	C) 0.4974	D) 3.97	
Q. 18)	Two fuzzy sets A and B defined on X are $A = \left\{ \dfrac{0.1}{x_1} + \dfrac{0.6}{x_2} + \dfrac{0.8}{x_3} + \dfrac{0.9}{x_4} + \dfrac{0.7}{x_5} + \dfrac{0.1}{x_6} \right\}$ $B = \left\{ \dfrac{0.1}{x_1} + \dfrac{0.7}{x_2} + \dfrac{0.5}{x_3} + \dfrac{0.2}{x_4} + \dfrac{0.1}{x_5} + \dfrac{0}{x_6} \right\}$ Evaluate $A \cup B$		A
	A) $\left\{ \dfrac{0.1}{x_1} + \dfrac{0.7}{x_2} + \dfrac{0.8}{x_3} + \dfrac{0.9}{x_4} + \dfrac{0.7}{x_5} + \dfrac{0.1}{x_6} \right\}$	B) $\left\{ \dfrac{0.1}{x_1} + \dfrac{0.6}{x_2} + \dfrac{0.5}{x_3} + \dfrac{0.2}{x_4} + \dfrac{0.1}{x_5} + \dfrac{0}{x_6} \right\}$	
	C) $A = \left\{ \dfrac{0.9}{x_1} + \dfrac{0.4}{x_2} + \dfrac{0.2}{x_3} + \dfrac{0.1}{x_4} + \dfrac{0.3}{x_5} + \dfrac{0.9}{x_6} \right\}$	D) $B = \left\{ \dfrac{0.9}{x_1} + \dfrac{0.3}{x_2} + \dfrac{0.5}{x_3} + \dfrac{0.8}{x_4} + \dfrac{0.9}{x_5} + \dfrac{1}{x_6} \right\}$	
Q. 19)	For the fuzzy set $A = \left\{ \dfrac{0.1}{x} + \dfrac{0.9}{y} + \dfrac{0.21}{z} + \dfrac{0.29}{u} + \dfrac{0.24}{v} + \dfrac{0.3}{w} \right\}$ Calculate the scalar cardinality		B
	A) 0.204	B) 2.04	
	C) 20.4	D) 0.0204	
Q. 20)	Fuzzy set A is called normal fuzzy set		B
	A) If it contain an element with membership grade 0	B) If it contain at least one element with membership grade 1	
	C) If it does not contain an element with membership grade 1	D) None of these	
Q.21)	If A and B are any two fuzzy sets then A∩B		C
	A) Max{ A(x), B(x) }	B) 1- membership grade function	
	C) Min{ A(x), B(x) }	D) None of these	
Q. 22)	The set { x / A(x) ≥ α } represent		D
	A) Strong α-cut of fuzzy set A	B) Fuzzy set A	
	C) Support of fuzzy set A	D) α-cut of fuzzy set A	

Q. 23)	Height of the fuzzy set $A = \left\{ \dfrac{0.1}{x} + \dfrac{0.85}{y} + \dfrac{0.91}{z} + \dfrac{0.9}{u} + \dfrac{0.24}{v} + \dfrac{0.3}{w} \right\}$ is		C
	A) 0.9	B) 0.1	
	C) 0.91	D) 1	
Q. 24)	The degree of subset hood $S(A, B)$ is defined as		B
	A) $\dfrac{|B|}{|A \cup B|}$	B) $\dfrac{|A \cap B|}{|A|}$	
	C) $\dfrac{|A|}{|A \cup B|}$	D) $\dfrac{|B|}{|A \cap B|}$	
Q. 25)	In fuzzy set A, the compliment of fuzzy set A is defined as		A
	A) $1 - A(x)$	B) $1 + A(x)$	
	C) $\dfrac{1}{A(x)}$	D) $1 * A(x)$	

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Instructions:

i. All Questions are **compulsory.**

ii. Figure to the right indicate **full marks**.

iii. Use of **non-programmable** calculator is allowed.

BT	CO's	Q. No.	Statement of Question	Marks
		Q.1	**Attempt the following**	**20**
L3	201.1	**a**	Let $V = R^+$ be the set of all positive reals. Define addition of any two members x and y to be the usual multiplication of numbers that is $x + y = x.y$, define scalar multiplication by a scalar k to any member is $x \in R^+$ to be x^k that is $k\,x = x^k$. Show that V is a vector space.	7
L3	201.2	**b**	Calculate the rank and nullity of the matrix $$A = \begin{bmatrix} 1 & 4 & 5 & 6 & 9 \\ 3 & -2 & 1 & 4 & -1 \\ -1 & 0 & -1 & -2 & -1 \\ 2 & 3 & 5 & 7 & 8 \end{bmatrix}$$	7
L3	201.3	**c**	Let F be a function defined by the formula $F(x, y) = (2x, x + y, x - y)$ from R^2 into R^3. Show that F is a linear transformation.	6
		Q.2	**Attempt the following**	**15**
L3	201.4	**a**	Using Euclidean inner product on R^3. Show that $u = (-3,1,0)$ *and* $v = (2,-1,3)$ Satisfy Cauchy-Schwarz inequality.	7
L3	201.5	**b**	Consider the fuzzy sets A and B given by $A(x)\dfrac{x}{x+2}$, $B(x) = \dfrac{x}{x+5}$ $X = \{0,1,2,3,...,10\}$ Calculate $\|A\|, \|B\|, S(A,B), S(B,A)$ **OR** Calculate α-cut and strong α-cut for $\alpha = 0,0.3,0.5,1$ where $A(x) = \dfrac{1}{1+10(x-2)^2}, \quad x \in [0,10].$	8

		Q.3	**Attempt the following**	**15**
L3	**201.6**	**a**	Define fuzzy cardinality of fuzzy set and calculate the fuzzy cardinality of the fuzzy set defined by $A(x) = \dfrac{35-x}{15}$, $x \in \{20, 22, 24, 26, 28, 30, 32, 34\}$. **OR** Determine which of the following fuzzy sets are fuzzy numbers $1. A(x) = \begin{cases} \tan x & , & 0 \le x \le \pi/4 \\ 0 & , & \text{Otherwise} \end{cases}$ $2. B(x) = \begin{cases} \min(1, x), & 0 \le x \le 10 \\ 0 & , & \text{Otherwise} \end{cases}$	**7**
L3	**201.6**	**b**	For the fuzzy set A and B defined on the Universal set X as $A(x) = \begin{cases} \dfrac{x+1}{2}, & -1 \le x \le 1 \\ \dfrac{3-x}{2}, & 1 < x \le 3 \\ 0 & , & x < -1,\ x > 3 \end{cases}$ $B(x) = \begin{cases} \dfrac{x-1}{2}, & 1 < x \le 3 \\ \dfrac{5-x}{2}, & 3 < x \le 5 \\ 0 & , & x \le 1,\ x > 5 \end{cases}$ Calculate fuzzy set $(A+B)$.	**8**