USN 01JST18EC055 Code: EC510

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING

JSS Technical Institutions Campus, Mysuru – 570 006, Karnataka

JANUARY/FEBRUARY 2021 SEMESTER END EXAMINATIONS

PROGRAMME: B.E.
BRANCH: E&C
SEMESTER: V
SECTION: 'A' & 'B'
PAPER SETTERS: 1) Ms. Anitha S. Prasad
2) Smt. Supreetha M.

DATE: 19.01.2021
DAY: Tuesday
TIME: 9.30 A.M. to 12.30 P.M.
DURATION: 3 hrs.
MAX. MARKS: 100

LINEAR ALGEBRA & APPLICATIONS

NOTE:
1. PART-A has compulsory questions.
2. Answer PART-B making use of Internal Choices.

PART – A

Q. No.	CO	CD	QUESTION	MARKS
1.	CO2	L3	Obtain the solution to the system of Linear Equations using Gauss Elimination Method. $x+2y+z=3$ $2x+3y+3z=10$ $3x-y+2z=13$	10
2.	CO1	L2	If W_1 and W_2 are finite dimensional subspaces of a vectorspace V, then prove that W_1+W_2 is finite dimensional and show that $\dim W_1+\dim W_2=\dim(W_1\cap W_2)+\dim(W_1+W_2)$	10
3.a)	CO4	L3	Show that the following transformation is a linear transformation $T:R^2$-R^2 defined by T(V)=T(x,y)=(x+y,x)	05
b)	CO4	L3	Show how the transformation matrix in different bases B and B^1 are related.	05

USN: Code: EC510

4.a)	CO1	L1	Define innerproduct spaces.	04
b)	CO3	L3	Let M=$M_{2,3}$ with innerproduct $\langle A,B\rangle = tr(B^T A)$ and Let $A=\begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \end{bmatrix}$ $B=\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ $C=\begin{bmatrix} 3 & -5 & 2 \\ 1 & 0 & -4 \end{bmatrix}$ Obtain a) $\langle A,B\rangle, \langle A,C\rangle, \langle B,C\rangle$ b) $\langle 2A+3B, 4C\rangle$ c) $\|A\|$ and $\|B\|$	06
5.a)	CO3	L4	The fraction of rental cars in Denver starts at $\frac{1}{50}=0.02$. The fraction outside Denver is 0.98. Every month, 80% of the Denver cars stay in Denver. Also 5% of the outside cars come in. Inspect the Eigen vector and 2 months vector.	05
b)	CO4	L3	Obtain the 3x3 incidence matrix for the triangular graph shown in fig (5b). The first row has -1 in column 1 and +1 in column 2. What vectors (x_1, x_2, x_3) are in its null space? How do you identify that (1,0,0) is not in its row space?	05

PART – B

Q. No.	CO	CD	QUESTION	MARKS
6.	CO2	L3	Obtain the solution to the system of Linear equations using LU factorization. $x_1+2x_2+3x_3=0$ $2x_1+2x_2+3x_3=3$ $-x_1-3x_2=2$	10
			OR	
7.a)	CO2	L3	Find the parametric solution of the following system of equation. $x+2y-3z=1$ $2x+5y-8z=4$ $3x+8y-13z=7$	05
b)	CO2	L3	Obtain the inverse of A $\begin{bmatrix} 1 & \frac{1}{2} & \frac{1}{3} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \end{bmatrix}$	05

USN: Code: EC510

8.a)	CO3	L3	Find the basis and dimension of the solution space W of each homogeneous system. $x+3y+2z=0$ $x+5y+z=0$ $3x+5y-8z=0$	05
b)	CO3	L4	Analyze whether the following vectors are linearly independent (1,0,-1,3) (-1,1,2,-1), (-3,5,8,1) & (0,4,5,3). Identify the dimension of the space spammed by these vectors and also the basic vectors.	05
			OR	
9.	CO3	L4	Consider the standard basis for R3,B $\{e_1,e_2,e_3\}$ and the basis $B^1=\{u,u_2,u_3\}$ where $u_1=(1,-1,1)$ $u_2=(0,1,2)$ $u_3=(3,0,-1)$. i) Solve for the change of basis matrix P from B to B^1 ii) Solve for change of basis matrix P from B^1 to B iii) Represent the vector u(1,4,6) in the basis B^1	10

10.a)	CO4	L3	Let $T:V\rightarrow W$ be a linear transformation then prove that i) R(T) is a subspace of W ii) N(T) is a subspace of V iii) T is one-to-one iff N(t)={0}	07
b)	CO4	L1	Define the Rank and Nullify of the Linear Transformation.	03
			OR	
11.	CO4	L3	Obtain the basis and dimension of the Kernel and Range of the Linear Transformation. The transformation T is defined by $T:R^5\rightarrow R^4$ $T(x_1,x_2,x_3,x_4,x_5)=(x_1-x_3+3x_4-x_5,x_2+x_4-x_5,2x_2-x_3+5x_4-x_5,-x_3+x_4)$	10

12.	CO4	L3	Suppose $A=\begin{bmatrix}4 & 1 & -1\\ 2 & 5 & -2\\ 1 & 1 & 2\end{bmatrix}$ i) Find all Eigen values of A ii) Find P such that $D=P^{-1}AP$ is diagonal iii) calculate A^8 using $A^m=PD^mP^{-1}$	10
			OR	
13.a)	CO4	L3	Find the minimal polynomial and characteristic polynomial for the given matrix $A=\begin{bmatrix}4 & -2 & 2\\ 6 & -3 & 4\\ 3 & -2 & 3\end{bmatrix}$	05

b)	CO4	L3	Consider the Matrix $A=\begin{bmatrix}2 & 2\\ 1 & 3\end{bmatrix}$ Obtain the Eigen values and Eigen vectors. Also find f(A) given $f(t)=t^4-3t^3-6t^2+7t+3$	05

14.a)	CO4	L3	Obtain the length of vectors in Hilbert space and check Schwartz inequality $V=(1,\frac{1}{2},\frac{1}{4}----), W=(1,\frac{1}{3},\frac{1}{4}--)$	05
b)	CO4	L3	Suppose f(x) is a square wave equal to 1 for $0\le x<\pi$ Then f(x) drops to -1 for $\pi\le x<2\pi$. 1 and -1 repeats forever, Solve for obtaining its fourier series.	05
			OR	
15.	CO4	L3	Solve for the singular value decomposition. $A=\begin{bmatrix}3 & 2 & 2\\ 2 & 3 & -2\end{bmatrix}$	10

Diagram

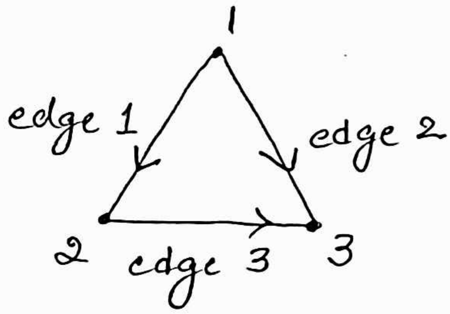
Course Outcome

At the end of the course the student should be able to -	
CO–1	Explain fields, vectorspaces and innerproducts spaces.
CO–2	Obtain the solution for the systems of linear equations.
CO–3	Analyze and solve the problems on the bases, dimensions and orthogonalization of vectors.
CO–4	Apply principles of matrix algebra to linear transformations and canonical forms.
CO–5	Engage in independent study as a member of a team and make effective presentation on the simulations and applications of Linear Algebra.

Cognitive Domains:	
L1:	Remembering
L2:	Understanding
L3:	Applying
L4:	Analyzing
L5:	Evaluating
L6:	Creating

--- End ---

fig (5 b)



EC510