Gaurang

USN 01JS20EC033

20EC510

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

5th Semester: Test I

LINEAR ALGEBRA AND APPLICATIONS

Duration : 1 Hour
Date:14/11/22

Max. Marks:20
Time: 11A.M-12 Noon

Note: 1. Q1 and Q2 compulsory.
2. Answer Q3 or Q4 and Q5 or Q6

Q. NO	CO	CD	QUESTION	MARKS	PI
1.	CO1	L3	Solve the given systems of linear equation by LU decomposition method $2x+y+z=2$; $x+3y+2z=2$; $3x+y+2z=2$	5	1.1.1
2.	CO1	L3	Find the inverse of matrix $A=\begin{bmatrix}1 & 2 & 1\\ 3 & 2 & 3\\ 1 & 1 & 2\end{bmatrix}$	5	1.1.2
3.	CO1	L3	Prove that inter section of any two subspaces of a vector space is a subspace.	5	2.2.2
			OR		
4.	CO1	L3	Explain necessary and sufficient condition for a non empty subset of W of vector space V to be a subspace.	5	2.2.2
5.	CO1	L3	Determine whether the given polynomials are linearly dependent or not $u=t^3+4t^2-2t+3$; $v=t^3+6t^2-t+4$; $w=3t^3+8t^2-8t+7$	5	2.1.3
			OR		
6.	CO1	L3	Find the basis and dimension of vectors u1=(1,2,-1,3,4) ; u2=(2,4,-2,6,8) ;u3=(1,3,2,2,6) ; u4=(1,4,5,1,8) ; u5=(2,7,3,3,9)	5	2.3.1

Cognitive Domains:
L1: Remember L2: Understand L3: Apply L4: Analyze L5: Evaluate L6: Create

Course Outcome: At the end of the course the students are able to	
CO1	Describe vector spaces and canonical forms with their application.
CO2	Apply principles of matrix algebra to linear transformations and canonical forms.
CO3	Analyze and solve the problems on the bases, dimensions and orthogonalization of vectors
CO4	Demonstrate the skill set to simulate the applications of Linear Algebra as a team member.

--- End ---

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20EC520

JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

V Semester: Test I

"Microwave and Antennas"

Duration: 1 Hr.
Date: 14-11-2022

Max. Marks: 20
Time: 04:00 – 05:00 pm

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	1	L2	Show that for the reciprocal network, symmetry of S matrix can be derived as $[S]^T = [S]$	05	2.4.1
2a	1	L2	Explain the effects of radiation hazards in Microwave frequency	03	1.3.1
2b	1	L1	List the application of microwave frequency in the field of wireless communication and commercial applications	02	1.3.1
3	1	L2	Describe the mechanism of amplification using Two cavity klystron, with a neat diagram	05	1.3.1
			OR		
4	1	L2	Explain construction and operational principle for a Magnetron	05	1.3.1
5	1	L2	With a neat sketch, Explain E- Plane and H- Plane Tee Junction	05	1.3.1
			OR		
6	1	L2	What are Phase shifters? Explain a rotary precision phase shifter with a neat sketch	05	1.4.1

Cognitive Domains:

L1: Remember **L2: Understand** **L3: Apply**
L4: Analyse **L5: Evaluate** **L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain the principles of microwave frequencies, sources, hazards of microwaves and system modelling using s-parameters.
CO2:	Analyse different terminologies associated with satellite communication, TV, RADAR, their applications.
CO3:	Design different types of antennas for microwave applications.
CO4:	Demonstrate the working microwave antennas using simulation tools.

--- End ---

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JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree
V Semester: Test – 1

"Control Systems"

Duration: 1 Hr. **Max. Marks: 20**
Date: 15 – 11 – 2022 **Time: 11.00 am – 12.00pm**

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	1	L2	For the loud speaker with electric circuit obtain the transfer function $\frac{X(S)}{V_a(S)}$ Take B = 0.5T, N = 20 turns, Bobbin Dia = 2cm	05	1.1.2
2	2	L3	Sketch the impulse response of a system with the following pole locations, a) S = - 1 b) S = 1 c) S = ± j2 d) S = - 1 ± j1 e) S = 1 ± j1	05	2.4.1
3	1	L3	Obtain $\frac{C(S)}{R(S)}$ for the system shown in Fig. Q (3) using block diagram reduction technique.	05	1.4.1
			OR		
4	1	L3	Obtain $\frac{C(S)}{R(S)}$ for the system shown in Fig. Q (4) using Mason's gain formula.	05	1.4.1
5	1	L3	For the mechanical system shown in Fig. Q (5), a) Draw the mechanical nodal equivalent circuit / free body diagram. b) Write the differential equations describing the system. c) Find $\frac{X_1(S)}{F(S)}$ if $M_1 = M_2 = 1$kg, $B_1 = B_2 = B_3 = 1$Ns/m, $K_1 = K_2 = 1$N/m.	05	1.1.2
			OR		
6	1	L3	For the electrical system shown in Fig. Q (6), obtain the transfer function $\frac{C(S)}{R(S)}$, taking R=1Ω and C=1F	05	1.1.2

Cognitive Domains:

L1: Remember	**L2: Understand**	**L3: Apply**
L4: Analyse	**L5: Evaluate**	**L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1	Explain the physical systems as mathematical model.
CO2	Analyze various properties of the control systems in time domain and frequency domain using appropriate tools.
CO3	Design and test the controllers for transfer function and state-space models.
CO4	Evaluate the state-space models of systems using appropriate tools.

CO5	Demonstrate the performance of controllers using modern tools.

FIGURES

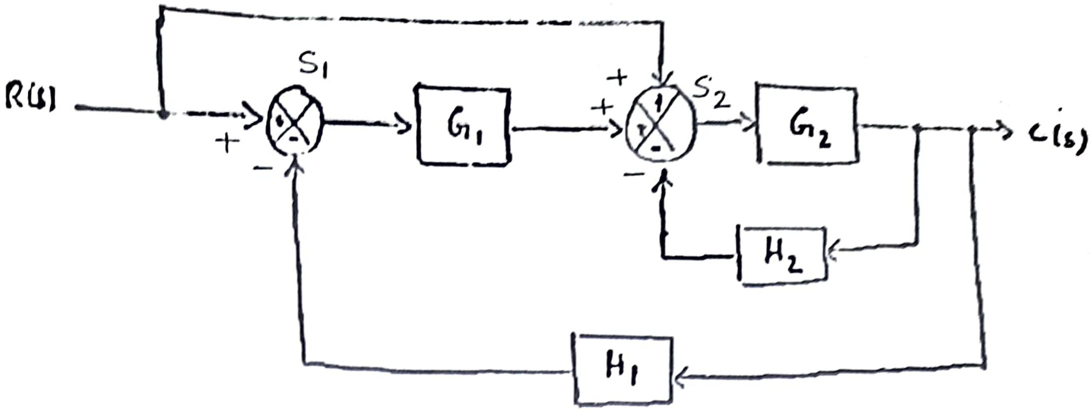

Fig. Q (3)

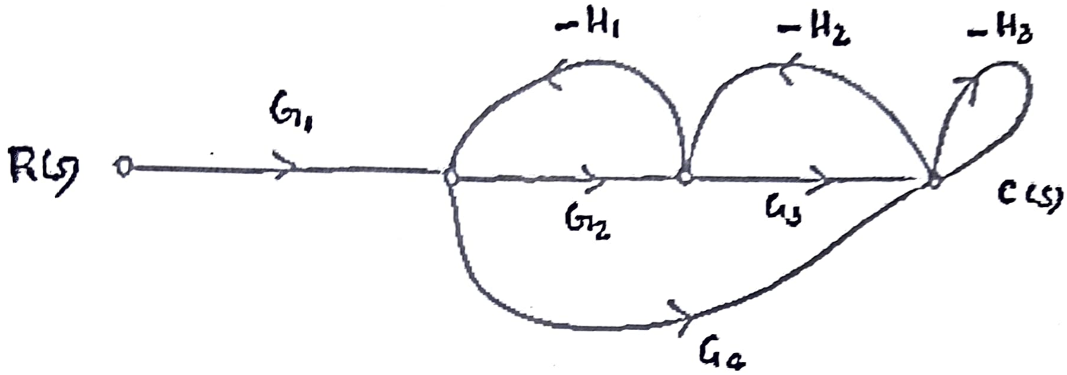

Fig. Q (4)

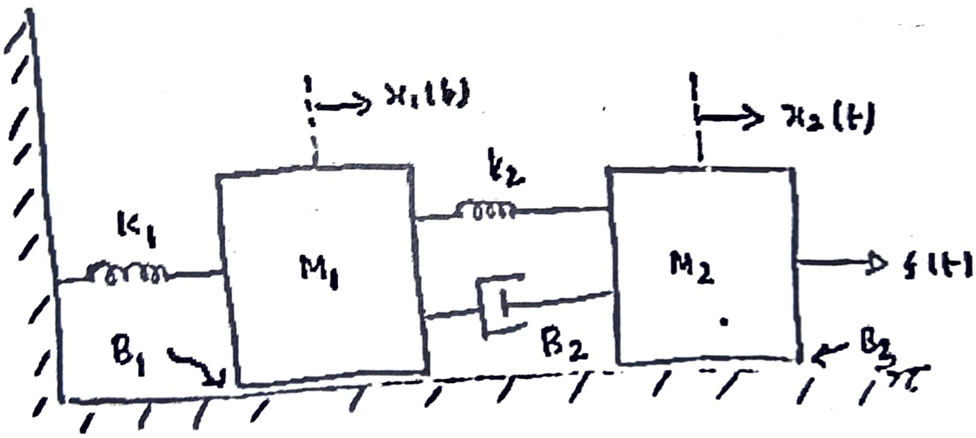

Fig. Q (5)

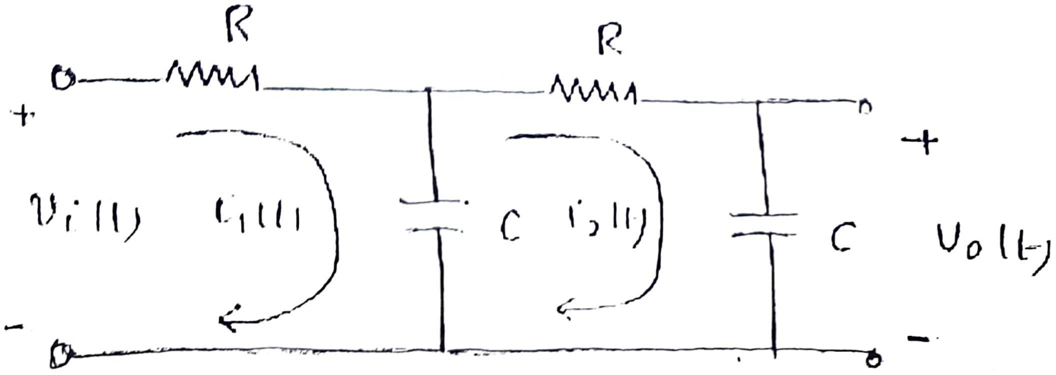

Fig. Q (6)

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20EC 540

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

5th Semester: Test 1

Digital Signal Processing

Duration: 1 Hr. | **Max. Marks: 20**

Date: 15.11.2022 | **Time:** 4 to 5PM

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	1	L3	Compute 5 point DFT of the sequence x(n) = {1,0,1,0,1} and hence verify conjugate symmetry property.	05	1.4.1
2	1	L3	Find IDFT of the following sequence using DFT. X(K) = {4, -j2, 0, j2}	05	1.4.1
3	1	L3	The 4 point DFT of a real sequence x(n) is X(K) = { 1, j , 1 ,-j}. Using Properties of DFT, find DFT of the following sequences. a) $x_1(n) = (-1)^n x(n)$ b) $x_2(n) = ((x(n+1))_4$	05	1.4.1
OR					
4	1	L3	Let x(n) be a 4-point sequence with X(K) = {0, 1+j, 1, 1-j} . Using properties of DFT, find DFT of the following sequences a) $x_1(n) = e^{j\frac{\pi}{2}n} x(n)$ b) $x_2(n) = Cos\left(\frac{\pi}{2} n\right) x(n)$	05	1.4.1
5	1	L2	Prove the Symmetry and Periodicity property of twiddle factor W_N.	05	1.2.1
OR					
6	1	L2	Prove that DFT{x(n) ⊛ h(n)} = X(K). H(K)	05	1.2.1

Cognitive Domains:

L1: Remembering | **L2: Understanding** | **L3: Applying**

L4: Analysing | **L5: Evaluating** | **L6: Creating**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain the representation of discrete-time signals in frequency domain and its properties, using discrete Fourier transform.
CO2:	Apply FFT algorithms to compute DFT
CO3:	Analyze, design and realize digital filters for the given specifications
CO4:	Implement applications of Digital Signal Processing algorithms using computer aided tool

--- End ---

Reviewed
BPK

Gurunraj

20EC555

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

V Semester: Test I

"Data Structure and Algorithms"

Duration: 1 Hr. **Max. Marks: 20**

Date: 16-11-2022 **Time: 11.00am to 12.00 noon**

Note:

Questions 1 and 2 are compulsory.

1. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	CO1	L2	Illustrate memory management operators using C++ program. List any 2 advantages of the memory management operators over C memory management operators	05	1.3.1
2	CO1	L2	What is Inheritance. Illustrate heirachical inheritance with example C++ program	05	1.3.1
3	CO1	L3	Create a class called 'EMPLOYEE' that has - EMPID and EMPNAME and EMPSALARY as data members - member function getdata( ) to input data - member function display( ) to output data. Write a main function to create EMP, an array of EMPLOYEE objects. Accept and display the details of at least 6 employees.	05	1.3.1
			OR		
4	CO1	L3	Using the concept of operator overloading, write a C++ program to overload + operator for calculating the sum of two numbers	05	1.3.1

5	CO1	L3	a) What is a friend function or friend class? What is the necessity of Friend function. Write the syntax.
			b) What will be the output of the following program:
			
			#include <iostream>
			using namespace std;
			
			void square (int *x, int *y)
			{
			    *x=(*x) * --(*y);
			}
			
			int main( )
			int number = 30;
			square(&number, &number);
			cout<< number;
			return 0;
			}
				05	1.3.1

			OR		

6	CO1	L3	a) What are Constructors and Destructors? b) What will be the output of the following program:	05	1.3.1

```cpp
#include <iostream>
using namespace std;
 class A
{
   int id;
   static int count;
public:
   A()
   {
      count++;
      id = count;
      cout << "constructor called " << id << endl;
   }
   ~A()
   {
      cout << "destructor called " << id << endl;
   }
};

int A::count = 0;
 int main()
{
   A a[2];
   return 0;
}
```

Cognitive Domains:

L1: Remembering	**L2: Understanding**	**L3: Applying**
L4: Analysing	**L5: Evaluating**	**L6: Creating**

Course Outcome: At the end of the course the students are able to	
CO1	Explain programming skills through Object Oriented Programming(OOP) and accessing different types of data structures

--- End ---

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20EC510

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

5th Semester: Test II

LINEAR ALGEBRA AND APPLICATIONS

Duration : 1 Hour
Date:15/12/22

Max. Marks:20
Time: 11.00AM-12.00PM

Note: 1. Q1 and Q2 compulsory.
2. Answer Q3 or Q4 and Q5 or Q6

Q.No	CO	CD	QUESTION	MARKS	PI
1.	CO2	L3	Let U and V be finite dimensional vector spaces over the field F such that dim. U = dim. V. If T is a linear transformation from U into V, then show that the following are equivalent i. T is invertible ii. T is non-singular iii. T is onto, i.e., the range of T is V iv. If $\{\alpha_1, \alpha_2, \ldots \alpha_n\}$ is a basis of U, then $\{T(\alpha_1), T(\alpha_2) \ldots T(\alpha_n)\}$ is a basis for V	5	2.3.2
2.	CO2	L3	Obtain the minimal polynomial of a matrix represented by a linear operator T: $R^3 \to R^3$ defined by T(x,y,z)=(2x+y, y-z, 2y+4z)	5	2.2.3
3.	CO2	L3	Obtain the characteristic equation of the matrix $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ Verify that it is satisfied by A and hence find A^{-1}.	5	2.4.1
			OR		
4.	CO2	L3	Show that the matrix $A=\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Also find the diagonal form and a diagonalizing matrix P	5	2.4.1

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20EC510

Q.No	CO	CD	QUESTION	MARKS	PI
5.	CO3	L3	Obtain the basis and dimension for kernel and Image of the linear transformation defined by T: $R^4 \to R^3$ $T(x,y,z,t) = (x-y+2z+t,\ x+2z-3t,\ x+2y+4z-3t)$	5	2.4.1
OR					
6.	CO3	L3	Let T be the linear operator on R^3 defined by $T(x_1,x_2,x_3) = (3x_1+x_3,\ -2x_1+2x_2,\ -x_1+2x_2+4x_3)$ i. Obtain the standard matrix of T. ii. Obtain the matrix T in the ordered basis $\{\alpha_1, \alpha_2, \alpha_3\}$ Given $\alpha_1(1,0,1)$ $\alpha_2(-1,2,1)$ $\alpha_3(2,1,1)$. iii. Prove that T is invertible and give a rule for T^{-1}.	5	2.4.1

Cognitive Domains:

L1: Remembering **L2: Understanding** **L3: Applying**

L4: Analyzing **L5: Evaluating** **L6: Creating**

Course Outcome: At the end of the course the students are able to	
CO1	Describe vector spaces and canonical forms with their application.
CO2	Apply principles of matrix algebra to linear transformations and canonical forms.
CO3	Analyze and solve the problems on the bases, dimensions and orthogonalization of vectors.
CO4	Demonstrate the skill set to simulate the applications of Linear Algebra as a team member.

--- End ---

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20EC520

JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree
V Semester: Test 2

"Microwave and Antennas"

Duration: 1 Hr.
Date: 15-12-2022

Max. Marks: 20
Time: 03:45 – 04:45 pm

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	2	L2	In a satellite communication system, free space conditions may be assumed. The satellite is at a height of 36,000km above earth, the frequency used is 4000 MHz, the transmitting antenna gain is 15dB and the receiving antenna gain is 45dB. Calculate (a) The free space transmission loss (b) The received power when the transmitted power is 200W	05	2.1.2
2	2	L2	Explain the principles of scanning applied in radiometry	05	1.2.1
3	2	L1	What is Satellite? List the characteristics of different satellite orbits.	05	1.3.1
			OR		
4	2	L1	Discuss briefly a. Kepler's law of planetary motion b. Orbital parameters- Apogee, Perigee	03 02	1.2.1
5	2	L2	Derive Link-Power Budget Equation and obtain the equation for received power.	05	2.1.2
			OR		
6	2	L2	Illustrate with a neat diagram the two segments of a satellite communication systems	05	1.3.1

Cognitive Domains:

L1: Remember	**L2: Understand**	**L3: Apply**
L4: Analyse	**L5: Evaluate**	**L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain the principles of microwave frequencies, sources, hazards of microwaves and system modelling using s-parameters.
CO2:	Analyse different terminologies associated with satellite communication, TV, RADAR, their applications.
CO3:	Design different types of antennas for microwave applications.
CO4:	Demonstrate the working microwave antennas using simulation tools.

--- End ---

USN 0 1 J S T 2 0 E C 0 3 7

20EC530

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

V Semester: Test 2

Control Systems

Duration: 1 Hr.
Date: 16-12-2022

Max. Marks: 20
Time: 11:00-12:00 PM

Note:

1. **Questions 1 and 2 are compulsory.**
2. **Answer the remaining questions by making use of internal choice appropriately.**

Q. No.	CO	CD	Questions	Marks	PI
1	CO2	L3	The open loop transfer function of a certain control system is given by $G(S)H(S) = \frac{K}{S(S+1)(S+2)}$ (a) Sketch the root locus on real axis. (b) Find the angle of asymptotes (c) Compute the centroid. (d) Calculate the valid breakaway point (points) and the value of K at these points.	05	2.1.2
2	CO2	L2	For the system of Q1 (a) Find the range of K for the stability of the system (b) Compute the frequency of oscillations when K= K_{mar} (c) Sketch the approximate root locus.	05	2.2.1
3	CO2	L3	Determine the stability of the system with characteristic polynomial $F(s) = S^3 + 12S^2 + 47S + 60$ about the line S= -2.	05	2.1.2
			OR		
4	CO2	L3	(a) Given that $G(s)H(S) = \frac{K}{S^2+2S+10}$, determine the value of K to achieve steady state error, $e_{ss} \leq 0.5$ to a step input of magnitude 2 units, i.e., r(t) = 2 u(t). (b) Given that $G(S)H(S) = \frac{K}{S(S+1)(S+4)}$, find K for a steady state error $e_{ss} \leq 2$ to a ramp input, r(t) = 2t.	05	2.1.2
5	CO3	L3	Figure Q(5) shows the PID controller connected in cascade with a	05	

			second order system. (a) Obtain the expression for the controller transfer function $$G_C(S) = \frac{E_a(S)}{E(S)}$$ (b) Find the expression for the closed loop transfer function $\frac{C(S)}{R(S)}$ (c) Determine the condition under which the system is stable.		2.1.3
			OR		
6	CO3	L3	For a passive phase lead compensator (a) Derive the expression for $\frac{V_O(S)}{V_i(S)}$ (b) Determine the condition under which the compensator gives lead angle (c) Sketch the poles and zeros in s-plane.	05	2.1.3

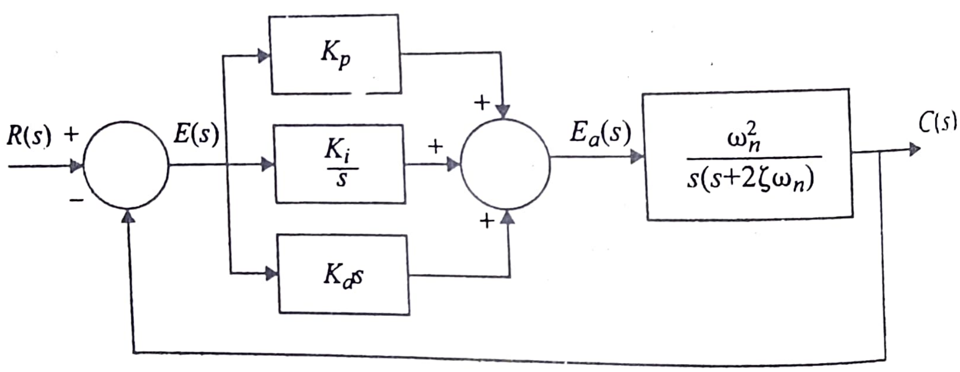

Figure Q5

Cognitive Domains:

L1: Remember **L2: Understand** **L3: Apply**
L4: Analyse **L5: Evaluate** **L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1	Explain the physical systems as mathematical model.
CO2	Analyze various properties of the control systems in time domain and frequency domain using appropriate tools.
CO3	Design and test the controllers for transfer function and state-space models.
CO4	Evaluate the state-space models of systems using appropriate tools.
CO5	Demonstrate the performance of controllers using modern tools.

--- End ---

20EC 540

USN 01JST20EC033

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

5th Semester: Test 2

Digital Signal Processing

Duration: 1 Hr. **Max. Marks: 20**

Date: 16.11.2022 **Time: 3.45pm to 4.45pm**

Note:

1. Questions 1 is compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	2	L3	Compute y(n) =x(n) * h(n) using overlap-save method. Verify the result by direct computation. x(n) = { 1,2,0,-3,4,2,-1,1,-2,3,4,2,1,-3} and h(n) ={1,1,1}	10	2.2.3
2	2	L3	Develop Radix-2 DIF FFT algorithm for N=8. Draw the complete signal flow graph.	05	2.2.3
			OR		
3	2	L3	Develop DIT FFT algorithm for computing DFT of sequence of length N = 3X2. Draw the complete signal flow graph. Show all the equations clearly.	05	2.2.3
4	2	L2	Compute 4 point DFT of the sequence x(n) using Radix-2 DIT FFT algorithm. x(n)= {1,2,3,0}.	05	2.2.3
			OR		
5	2	L2	Find IDFT of the sequence X(K) using Radix-2 DIF FFT algorithm. X(K) {6, -2+j2, -2, -2-j2}.	05	2.2.3

Cognitive Domains:

L1: Remembering	**L2: Understanding**	**L3: Applying**
L4: Analysing	**L5: Evaluating**	**L6: Creating**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain the representation of discrete-time signals in frequency domain and its properties, using discrete Fourier transform.
CO2:	Apply FFT algorithms to compute DFT
CO3:	Analyze, design and realize digital filters for the given specifications
CO4:	Implement applications of Digital Signal Processing algorithms using computer aided tool

--- End ---

SPK

USN 01JST20EC033

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

V Semester: Test II

"Data Structure and Algorithms"

Duration: 1 Hr. **Max. Marks: 20**

Date: 17-12-2022 **Time: 11.00 am to 12 noon**

Note: Questions 1 and 2 are compulsory.
Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	CO2	L3	List any four differences between Stacks and Queues. Write a C++ program to reverse a string JSSSTUSJCE using stack.	05	1.3.1
2	CO2	L3	List any two advantages and disadvantages of Linked list over stacks and queue data structure. Write a C++ program with OOPs concept to create three nodes in a linked list	05	1.3.1
3	CO2	L3	Convert the following expressions using stack i) Infix to prefix : k+l-m*n+(o^p)*w/u/v/*t+q ii) Postfix to infix : abc/-ad/e-*	10	1.3.1
			OR		
4	CO2	L3	Write C++ function to with respect to single linked list I) To insert an element at the middle of the linked list II) To merge two lists one list with only odd and another list with only even numbers	10	1.3.1

Cognitive Domains:

L1: Remember **L2: Understand** **L3: Apply**

L4: Analysisis **L5: Evaluate** **L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain programming skills through Object Oriented Programming(OOP) and accessing different types of data structures
CO2:	Apply programming skills through OOPs and efficient storage mechanisms of data for an easy access
CO3:	To design, evaluate and implementation of various basic and advanced data structures for skill enhancement in problem solving and develop applications.
CO4:	Develop and demonstrate innovative programming solutions/ Refine available solutions by improving the existing code and select algorithm design approaches in a problem specific manner.

--- End ---

SPK
12/12/2022

USN												

"20CS562"

3	CO2	L1	1.7.1	a. Why threads are called LWP? Explain its benefits.	05
		L2	2.6.3	b. Describe the differences among long-term scheduling. short-term, and medium-term scheduling.	05

Course Outcome: At the end of the course the students will have the ability to	
CO–1	Understand various activities of process, thread, memory, file and secondary storage components of an Operating System.
CO–2	Apply various scheduling algorithm of process, memory and secondary storage components.
CO–3	Analyze the concepts of inter process communication, deadlocks, memory allocation strategies, page replacement algorithms of OS.
CO–4	Evaluate various algorithms for handling processes, threads, memory allocation strategies and deadlocks.

Cognitive Domain (CD)	
L1	Knowledge
L2	Comprehension
L3	Application
L4	Analysis

Performance Indicator (PI)	
1.7.1	Apply theory and principles of computer science and engineering to solve an engineering problem
2.6.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions

USN	0	1	J	S	T	2	0	E	C	0	3	3

20EC510

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

5th Semester: Test III

LINEAR ALGEBRA AND APPLICATIONS

Duration : 1 Hour — Max. Marks:20

Date:16/1/23 — Time:11A.M-12 noon

Note: 1. Q1 and Q2 compulsory.
2. Answer Q3 or Q4 and Q5 or Q6

Q.NO	CO	CD	QUESTION	MARKS	PI
1.	CO3	L3	Obtain singular value decomposition of A = $\begin{bmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{bmatrix}$	8	1.1.1
2.	CO3	L2	Explain briefly principal component analysis.	2	1.1.2
3.	CO3	L3	Find orthogonal basis by Gram-Schmidt orthogonalization process for column vector A= $\begin{bmatrix} 3 & -5 & 1 \\ 1 & 1 & 1 \\ -1 & 5 & -2 \\ 3 & -7 & 8 \end{bmatrix}$	5	2.2.2
			OR		
4.	CO3	L3	Find a least-squares solution of the inconsistent system with column vectors A= $\begin{bmatrix} 1 & --6 \\ 1 & -2 \\ 1 & 1 \\ 1 & -1 \end{bmatrix}$ b = $\begin{bmatrix} -1 \\ 2 \\ 1 \\ 6 \end{bmatrix}$	5	2.2.2
5.	CO3	L3	Find the QR factorization for column vectors A= $\begin{bmatrix} 2 & 3 \\ 2 & 4 \\ 1 & 1 \end{bmatrix}$	5	2.1.3
			OR		
6.	CO3	L3	Construct spectral decomposition for matrix A= $\begin{bmatrix} 3 & 4 \\ 4 & 9 \end{bmatrix}$	5	2.3.1

Cognitive Domains:
L1: Remember L2: Understand L3: Apply L4: Analyze L5: Evaluate L6: Create

Course Outcome: At the end of the course the students are able to	
CO1	Describe vector spaces and canonical forms with their application.
CO2	Apply principles of matrix algebra to linear transformations and canonical forms.
CO3	Analyze and solve the problems on the bases, dimensions and orthogonalization of vectors
CO4	Demonstrate the skill set to simulate the applications of Linear Algebra as a team member.

--- End ---

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USN 0 1 J S T 2 0 E C 0 3 3

JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree
V Semester: Test 3

"Microwave and Antennas"

Duration: 1 Hr. **Max. Marks: 20**
Date: 16-01-2023 **Time: 03:45 – 04:45 pm**

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	3	L2	Explain the following a. Patterns b. Radiation Intensity c. Beam Efficiency	05	2.1.1
2	2	L2	Mention the purpose of using Radar display and explain its types.	05	2.2.4
3	2	L2	Explain Moving Target Indication Radar and derive the equation velocity for calculating blind speed.	05	2.2.3
			OR		
4	2	L2	Explain Frequency modulated continuous wave radar and derive the equation for doppler frequency shift	05	2.2.3
5	2	L2	With a neat block diagram, explain Amplitude comparison monopulse tracking radar for a single angular coordinate	05	1.3.1
			OR		
6	2	L2	With a neat block diagram, explain a system using a radar beacon and mention its application	05	1.3.1

Cognitive Domains:

L1: Remember **L2: Understand** **L3: Apply**
L4: Analyse **L5: Evaluate** **L6: Create**

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Course Outcome: At the end of the course the students will able to	
CO1:	Explain the principles of microwave frequencies, sources, hazards of microwaves and system modelling using s-parameters.
CO2:	Analyse different terminologies associated with satellite communication, TV, RADAR, their applications.
CO3:	Design different types of antennas for microwave applications.
CO4:	Demonstrate the working microwave antennas using simulation tools.

--- End ---

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

V Semester: Test 3

Control Systems

Duration: 1 Hr. | Max. Marks: 20

Date: 17-01-2023 | Time: 11:00 am-12:00 noon

Note:

1. Questions 1 and 2 are compulsory.
2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	CO2	L2	Explain the following terms (a) gain cross over frequency. (b) phase cross over frequency. (c) gain margin. (d) phase margin. (e) Enclosure.	05	2.1.1
2	CO4	L3	A system is described by the following state equations $\dot{x}(t)=\begin{bmatrix}0 & 1\\ -12 & -8\end{bmatrix}x(t)+\begin{bmatrix}0\\1\end{bmatrix}u(t)$ $y(t)=[8 \quad 1]\,x(t)$ Applying the Laplace transform technique, obtain the transfer function of the system.	05	2.3.1
3	CO2	L3	Construct the Bode magnitude plot of the system having open-loop transfer function, $G(S)H(S)=\frac{8}{S(S+2)(S+4)}$. Find the gain cross over frequency.	05	2.2.4
			OR		
4	CO2	L3	Construct the Nyquist's plot of the system having open-loop transfer function $G(S)H(S)=\frac{K}{S(S+1)(S+2)}$. Determine the value of K for the closed loop stability.	05	2.2.4
5	CO4	L3	For the system described in **Q2,** solve for the natural response and forced response given that, $x(0)=\begin{bmatrix}0\\1\end{bmatrix}$ and input is unit step.	05	2.3.1
			OR		
6	CO4	L3	Develop state model for the system shown in Fig. **Q6**.	05	2.3.1

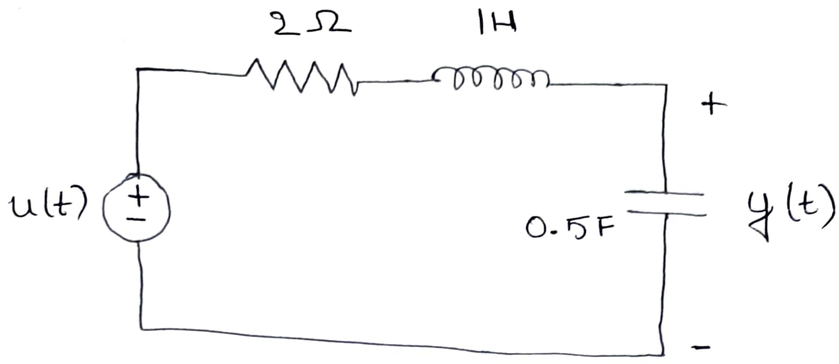

Fig. Q6

Cognitive Domains:

L1: Remember **L2: Understand** **L3: Apply**

L4: Analyse **L5: Evaluate** **L6: Create**

Course Outcome: At the end of the course the students are able to	
CO1	Explain the physical systems as mathematical model.
CO2	Analyze various properties of the control systems in time domain and frequency domain using appropriate tools.
CO3	Design and test the controllers for transfer function and state-space models.
CO4	Evaluate the state-space models of systems using appropriate tools.
CO5	Demonstrate the performance of controllers using modern tools.

--- End ---

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

5th Semester: Test 3

Digital Signal Processing

Duration: 1 Hr. **Max. Marks: 20**

Date: 17.01.2023 **Time: 3.45pm to 4.45pm**

Note: 1. Questions 1 and 2 are compulsory.

2. Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	3	L3	Given that $\lvert H(\Omega)\rvert^2 = \frac{1}{1+16\Omega^4}$ Determine the analog butterworth filter system function H(S).	05	1.4.1
2	3	L3	Let $H(S) = \frac{1}{S^2+S+1}$ represent the transfer function of a low pass filter with cut off frequency of 1 rad/sec. Obtain transfer function of a band pass filter with a passband of 10 rad/sec and centre frequency of 100 rad/sec.	05	1.4.1
3	3	L3	Determine H(Z) for a lowest order Butterworth filter satisfying following constraints $\sqrt{0.5} \le \lvert H(\omega)\rvert \le 1 \quad for \quad 0 \le \lvert\omega\rvert \le \frac{\pi}{2}$ $\lvert H(\omega)\rvert \le 0.2 \; for \; \frac{3\pi}{4} \le \lvert\omega\rvert \le \pi$. Apply Impulse Invariant Transformation with T=1 Sec.	10	1.4.1
OR					
4	3	L3	Design a digital lowpass Chebyshev filter to meet the following specifications: $0.8 \le \lvert H(\omega)\rvert \le 1 \quad for \; 0 \le \lvert\omega\rvert \le 0.2\pi$ $\lvert H(\omega)\rvert \le 0.2 \quad for \; 0.32\pi \le \lvert\omega\rvert \le \pi$ Use Bilinear transformation with T=2 Sec.	10	1.4.1

Cognitive Domains:

L1: Remembering **L2: Understanding** **L3: Applying**

L4: Analysing **L5: Evaluating** **L6: Creating**

Course Outcome: At the end of the course the students are able to	
CO1:	Explain the representation of discrete-time signals in frequency domain and its properties, using discrete Fourier transform.
CO2:	Apply FFT algorithms to compute DFT
CO3:	Analyze, design and realize digital filters for the given specifications
CO4:	Implement applications of Digital Signal Processing algorithms using computer aided tool

--- End ---

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Electronics and Communication Engineering

Bachelor of Engineering Degree

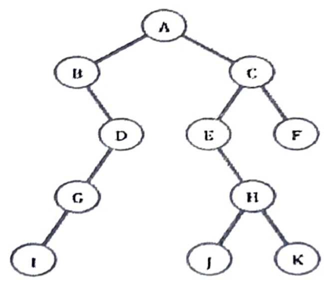
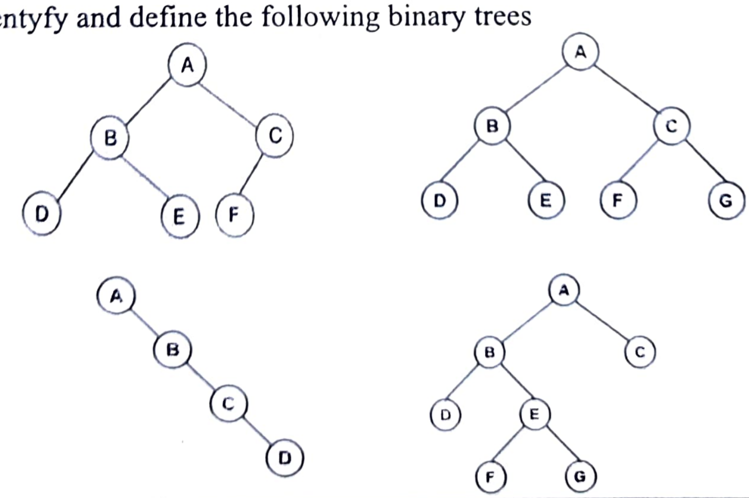
V Semester: Test III

"Data Structure and Algorithms"

Duration: 1 Hr. **Max. Marks: 20**

Date : 18-01-2023 **Time : 11-00 am - 12-00 noon**

Note: Questions 1 and 2 are compulsory.
Answer the remaining questions by making use of internal choice appropriately.

Q. No.	CO	CD	Questions	Marks	PI
1	CO3	L	Define general and binary trees. Write the array and linked representation of trees	05	1.3.1
2	CO3	L3	Given two arrays pre[] = {1, 2, 4, 8, 9, 5, 3, 6, 7} and post[] = {8, 9, 4, 5, 2, 6, 7, 3, 1}that represent preorder and postorder traversals of a full binary tree, construct the binary tree.	05	1.3.1
3	CO3	L3	i) Obtain the preorder, post order and inorder traversal for the following tree  ii) Identyfy and define the following binary trees 	5+5	1.3.1
OR					
4	CO3	L3	i) Construct a Expression tree for the following expression 2 5 1 3 6 7 4 a/b+c^d*e-f+g*h ii) Define AVL Tree. Construct the AVL tree for the following elements 23,56,12,45,98,34,54,20,17,15	6+4	1.3.1

Reviewed
SPK 18/01/22

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

V Semester BE Degree Examination

Department of E&CE

Linear algebra and applications

Duration: 3hrs | Max. Marks:100

NOTE: 1. PART- A has compulsory questions and PART- B has internal choices.
2. Answer all the questions.

PART – A

Q.NO	CO	CD	PI	Find the inverse of AQUESTION	MARKS
1.	CO1	L1	1.1.2	a) Find the inverse of A= $\begin{pmatrix} 1 & 2 & -4 \\ -1 & -1 & 5 \\ 2 & 7 & 3 \end{pmatrix}$	5
	CO1	L1	2.1.3	b) Show that the set of all real valued continuous functions defined on [0,1] is a vector space over field of reals.	5
2.	CO2	L1	2.2.3	a) Define the range and Null space of a linear transformation.	4
	CO2	L1	1.1.2	b) Let $F :: R^4 \to R^3$ be the linear mapping defined by $f(x,y,z,t) = (x-y+z+t,\ x+2z-t,\ x+y+3z-3t)$. Find the basis and dimension of range of F & Null space of F.	6
3.	CO3	L5	2.1.3	a) Determine Eigen values and unit Eigen vectors for the matrix AA^T, if A= $\begin{pmatrix} 4 & 11 & 14 \\ 8 & 7 & -2 \end{pmatrix}$	5
	CO3	L1	1.1.2	b) Consider the following polynomials in **P**(t) with the inner product $< f,g >= \int_0^1 f(t)g(t)dt$: where $f(t) = t^2 + 2$, $g(t) = 3t^2 - 2$ and $h(t) = t^2 - 2t - 3$. Find i) <f,g> and <f,h> ii) $\lVert f \rVert$ and $\lVert g \rVert$ iii) Normalize f and g.	5
4.	CO3	L2	1.1.2	a) For x in R^3, let $Q(x)$ = Q(x)=$5x_1^2 + 3x_2^2 + 2x_3^2 - x_1x_2 + 8x_2x_3$. Obtain the quadratic form as $x^T Ax$.	5
	CO3	L2	1.1.2	b) Find the maximum and minimum values of $Q(x) = 9x_1^2 + 4x_2^2 + 3x_3^2$ subject to the constraint	5

				$x^T x = 1$.	
5.	CO2	L1	2.4.1	a) Suppose W is invariant under $S = V \rightarrow V$ and $T: V \rightarrow V$. Show that W is also invariant under S+T and ST.	5
	CO2	L1	2.4.1	b) Let A be a square matrix over the complex field C. Suppose λ is an Eigen value of A^2. Show that $\sqrt{\lambda}$ or $-\sqrt{\lambda}$ is an Eigen value of A.	5

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6	CO1	L5	2.4.1	a) If a finite dimensional vector space V(F) be the direct sum of its two subspaces w_1 and w_2. Then prove that $dim(V) = dim(w_1) + dim(w_2)$.	5
	CO1	L2	1.1.2	b) Obtain the polynomial $f(x) = x^2 + 4x - 3$ over R as a linear combination of the polynomials $f_1(x) = x^2 - 2x + 5$, $f_2(x) = 2x^2 - 3x$ and $f_3(x) = x + 3$.	5
				OR	
7	CO1	L2	1.1.1	a) Find the LU factorization of the matrix A= $\begin{pmatrix} 1 & 2 & 1 \\ 2 & 3 & 3 \\ 3 & -10 & 2 \end{pmatrix}$	5
	CO1	L2	2.1.3	b) Determine whether or not the vectors u=(1,1,2), v=(2,3,1), w=(4,5,5) in R^3 are linearly dependent.	5
8	CO2	L1	2.4.1	a) Let T_1 and T_2 be linear operations on R^2 defined as follows $T_1(x_1, x_2) = (x_2, x_1)$ and $T_2(x_1, x_2) = (x_1, 0)$. Show that $T_1 T_2 = T_2 T_1$.	5
	CO2	L5	2.4.1	b) Let T be a linear operator on R^3 defined by $T(x, y, z) = (3x + z,\ -2x + y,\ -x + 2y + 4z)$. Prove that T is invertible.	5
				OR	
9	CO2	L2	2.4.1	a) Consider the following linear operator G on R^2 and basis S: $G(x, y) = (2x - 7y,\ 4x + 3y)$ and $S = \{u_1, u_2\} = \{(1,3), (2,5)\}$	6

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	CO2	L2	1.1.1	i) Find the matrix representation $[G]_S$ of G relative to S. ii) Verify $[G]_S[v]_S=[G(v)]_S$ for the vector v=(4,-3) in R^2. b) Let A= $\begin{pmatrix} 4 & -2 \\ 3 & 6 \end{pmatrix}$ and P= $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Find i) $B=P^{-1}AP$. and ii) Verify $tr(B)=tr(A)$.	4
10	CO3	L2	1.1.1	a) Diagonalize the following matrix, If possible. A= $\begin{pmatrix} 1 & 3 & 3 \\ -3 & -5 & -3 \\ 3 & 3 & 1 \end{pmatrix}$ Find an invertible matrix P and diagonal matrix D such that $A=PDP^{-1}$	5
	CO3	L3	2.3.1	b) Let W=Span{x_1,x_2}, where x_1 = $\begin{pmatrix} 3 \\ 6 \\ 0 \end{pmatrix}$ and x_2= $\begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix}$ Construct an orthogonal basis(v_1, v_2) for W.	5
				OR	
11	CO3	L2	1.1.1	Find the least square solution of the inconsistent system Ax=b. A= $\begin{pmatrix} 4 & 0 \\ 0 & 2 \\ 1 & 1 \end{pmatrix}$, b = $\begin{pmatrix} 2 \\ 0 \\ 11 \end{pmatrix}$	10

12	CO3	L2	1.1.1	Find a singular value decomposition of A. A= $\begin{pmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{pmatrix}$	10
				OR	
13	CO2	L5	2.2.3	a) Three measurements are made on each of four individuals in a random sample from a population. The observed vectors are X_1 = $\begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$, X_2= $\begin{pmatrix} 4 \\ 2 \\ 13 \end{pmatrix}$, X_3= $\begin{pmatrix} 7 \\ 8 \\ 1 \end{pmatrix}$, X_4= $\begin{pmatrix} 8 \\ 4 \\ 5 \end{pmatrix}$	5

	CO2	L2	1.1.1	Obtain the sample mean and covariance matrix. b) Find the matrix of the quadratic form. Assume x is in R³ of $8x_1^2+7x_2^2-3x_3^2-6x_1x_2+4x_1x_3-2x_2x_3$.	5

14	CO3	L2	2.4.1	a) Suppose $W_1, W_2 ... W_r$ are subspaces of V with respective bases $B_1=\{w_{11}, w_{12}, \dots, w_{1n1}\}, \dots B_r=\{w_{r1}, w_{r2}, \dots, w_{mr}\}$. Then prove that V is the direct sum of the W_i if and only if union $B=\cup_i B_i$ is a basis of V.	6
	CO3	L2	2.2.3	b) Obtain any three possible Jordan canonical forms for a linear operator $T:V\to V$, whose characteristic polynomial is $\Delta(x) = (x-2)^3(x-5)^2$.	4
OR					
15	CO2	L2	1.1.1	Let V be a vector space of dimension 6 over R and let T be a linear operator whose minimal polynomial is $m(x)=(x^2-x+3)(x-2)^2$. Find the rational canonical form of T.	10

Course Outcome: At the end of the course the students will have the ability to	
CO–1	Describe vector spaces and canonical forms with their application.
CO–2	Apply principles of matrix algebra to linear transformations and canonical forms.
CO–3	Analyze and solve the problems on the bases, dimensions and orthogonalization of vectors.
CO–4	Demonstrate the skill set to simulate the applications of Linear Algebra as a team member.

Performance Indicator:

1.1.1	Apply mathematical techniques such as linear algebra, differential calculus, differential equations and integral calculus to solve problems
1.1.2	Apply concepts of Complex Variable, probability, linear algebra, vector integration and transformation techniques to model and Solve electronics engineering problems.
2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem.
2.2.3	Identify existing solution/methods for solving the problem, including forming justified approximations and assumptions
2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate in terms of applicability and required accuracy.
2.4.1	Apply engineering mathematics to implement solution

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

V Semester BE Degree Examination

Department of Electronics and Communication Engineering

MICROWAVE AND ANTENNAS

Duration: 3 Hours

Max. Marks:100

NOTE: Part A all Questions are compulsory and carry equal marks

Answer the questions of Part B by making use of internal choice

PART – A

Q.NO	CO	CD	PI	QUESTION	MARKS
1.	CO1	L2	2.2.4	With a neat diagram, explain construction and operation of reflex klystron and mention its applications	10
2A.	CO2	L2	1.2.1	Explain the Kepler's law of planetary motion and how are they applicable to the geostationary satellite	06
2B	CO2	L2	1.2.1	What is a Satellite? Explain the need for satellite communication	04
3.	CO2	L2	2.1.3	With a neat block diagram, explain TV Transmitter	10
4A	CO2	L2	2.2.4	Compare between Continuous wave Radar and Pulse Radar	05
4B	CO2	L2	2.1.3	Obtain the equation for Doppler frequency shift	05
5.	CO3	L2	1.3.1	Define the following i) Beam Area ii) Directivity & Gain iii) Beam efficiency iv) Radiation Intensity v) Effective Height	10

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6	CO1	L2	1.3.1	State the properties of S –parameters. Prove the symmetry property and unitary property of S-parameter	10
				OR	
7A	CO1	L2	1.3.1	With a neat diagram, explain the working of precession type variable attenuator	05
7B	CO1	L2	1.3.1	Explain the characteristics of Magic Tee junction	05

8A	CO2	L2	1.3.1	Derive Link-Power Budget Equation and obtain the expression for ratio of carrier to noise power density.	05
8B	CO2	L2	1.2.1	Define the following i) Inclination ii) Prograde Orbit iii) Retrograde Orbit iv) Semi major axis v) Eccentricity	05

				OR		
9A	CO2	L2	1.2.1	Explain the types of Satellite Orbits	05	
9B	CO2	L2	1.2.1	Illustrate with a neat diagram the two segments of a satellite communication systems	05	
10	CO2	L2	2.1.3	Explain the sample positions with 4:2:2 digitization format and compare with 4:2:0 digitization format	10	
				OR		
11	CO2	L2	2.1.3	Explain principles of scanning and show how interlaced scanning can be used to minimize flicker	10	5
12	CO2	L2	2.2.4	Write the characteristics of different types of tracking radar with its applications	10	5
				OR		
13	CO2	L2	2.1.3	With a neat block diagram and waveform, explain conical scan tracking radar	10	
14	CO3	L2	2.1.3	Explain the working and design considerations of Helical Antenna geometry also mention its applications	10	
				OR		
15	CO3	L2	2.2.4	Explain the following types of antennas mentioning its advantages, disadvantages, and applications i) Parabolic reflector Antenna ii) Microstrip Patch Antenna	10	6

Course Outcome: At the end of the course the students will have the ability to	
CO-1	Explain the principles of microwave frequencies, sources, hazards of microwaves and system modelling using s-parameters.
CO-2	Analyse different terminologies associated with satellite communication, TV, RADAR, their applications.
CO-3	Design different types of antennas for microwave applications.
CO-4	Demonstrate the working microwave antennas using simulation tools.

Performance Indicator:

1.2.1	Apply laws of natural science to an engineering problem
1.3.1	Apply engineering fundamentals
2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
2.2.4	Compare and contrast alternative solution/methods to select the best methods.

--- End ---

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

VII Semester B. E. Degree Examination

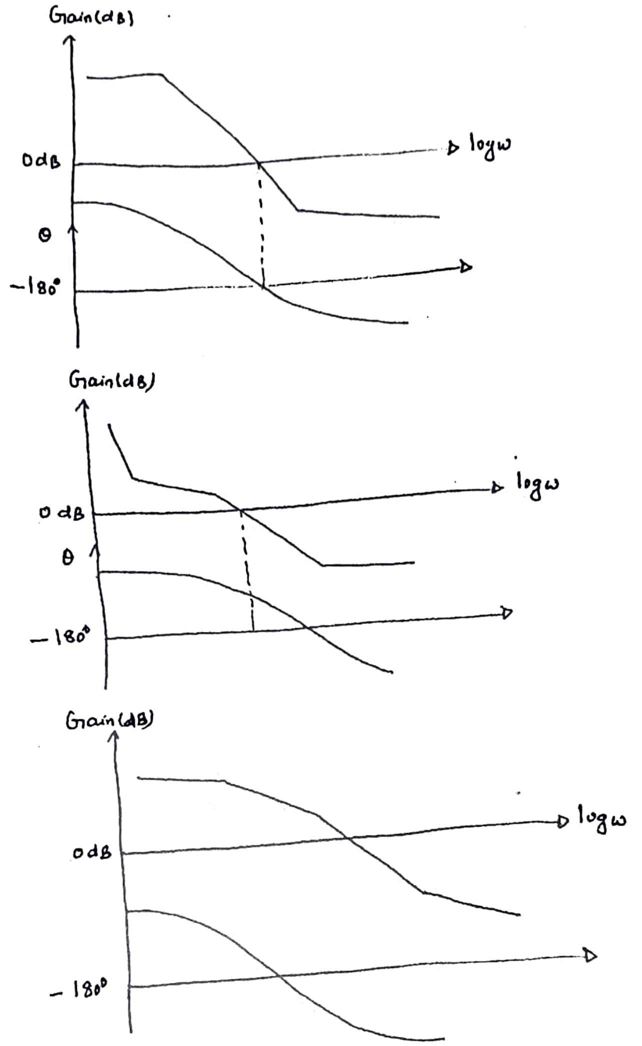
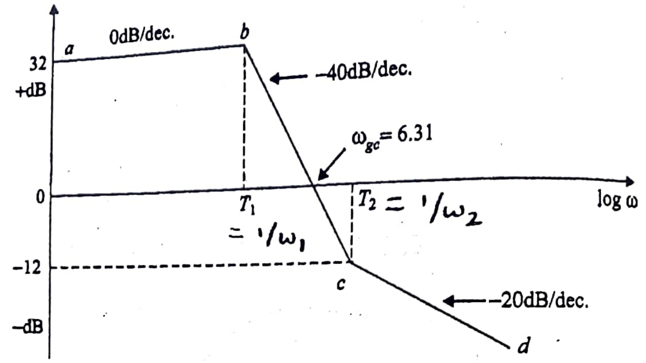
CONTROL SYSTEMS

Duration: 3 Hours **Max. Marks: 100**

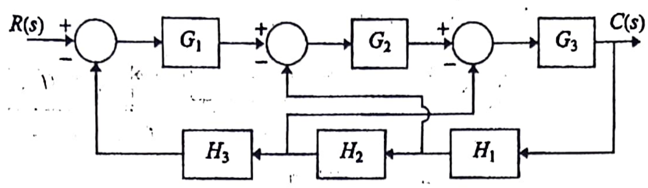
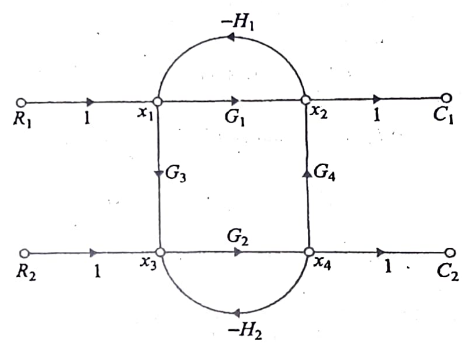
NOTE: 1) Answer all the questions in Part-A
2) Questions in Part-B have internal choice.

PART – A

Q. No.	CO	CD	PI	QUESTION	MARKS
1 (A)	1	L3	2.4.1	For the disk read write head mechanism, derive the expression for transfer function.	05
1 (B)	1	L3	2.4.1	Derive the expression for transfer function of loud speaker with circuit. Take N=20,d=2cm,B=0.5T	05
2	2	L3	2.4.2	Sketch the step response of second order under damped system. Derive the expressions for the following i. % Peak overshoot, M_P ii. Peak time, t_p iii. Settling time, t_s (2% tolerance band) iv. Rise time, t_r	10
3	2	L3	1.1.2	A unity feedback system has $G(S) = \frac{36\,(K_1+K_2\,S)}{S\,(S+4)}$ i. Obtain the expression for closed loop transfer function. ii. Find the expressions for ω_n and ξ iii. Find K_1 and K_2 if ω_n = 9 r/s and ξ = 0.8 iv. What ($K_1 + K_2S$) term represents?	10
4 (A)	4	L3	1.1.2	Given that $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-5 & -1\\ 3 & -1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}2\\ 5\end{bmatrix}u(t)$ $y = \begin{bmatrix}2 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ Obtain the transfer function of the system.	05
4 (B)	4	L3	1.1.2	Obtain the free response of the system having $A = \begin{bmatrix}-2 & 0\\ 1 & -1\end{bmatrix}$ and $x(0) = \begin{bmatrix}2\\ 3\end{bmatrix}$	05

Q. No.	CO	CD	PI	QUESTION	MARKS
5 (A)	2	L3	2.3.1	Comment on the stability of the systems having Bode plots shown in Fig. Q5(a)  Fig. Q5(a)	06
5 (B)	2	L3	2.3.1	The bode magnitude plot of the system is shown in Fig. Q5(b), compute its transfer function.  Fig. Q5(b)	04

PART – B

Q. No.	CO	CD	PI	QUESTION	MARKS
6	2	L3	2.3.1	For the block diagram shown in Fig. Q (6), obtain the transfer function $\frac{C(S)}{R(S)}$, using block diagram reduction method.  Fig. Q (6)	10
				OR	
7	2	L3	2.3.1	For the signal flow graph of Fig. Q (7) compute the output C_1 with $R_2 = 0$ and $R_1 = 0$ separately and also find the total output C_1 when both R_1 and R_2 are applied simultaneously. Take $C_2 = 0$  Fig. Q (7)	10
8	3	L3	3.1.6	The characteristic polynomial of a system is given by $F(S) = S^6 + 2S^5 + 8S^4 + 12S^3 + 16S + 16$. Using R – H criteria determine all the roots of F (S) and plot them in S – plane. Also, comment on the stability of the system.	10
				OR	
9	3	L3	3.1.6	The open loop transfer function of a feedback system is given by $$G(S)H(S) = \frac{1}{S(1+0.5S)(1+0.2S)}$$ Determine the steady state error for unit step, unit ramp and unit parabolic inputs. Compute the steady state error when all the inputs are simultaneously applied.	10

Q. No.	CO	CD	PI	QUESTION	MARKS
10	3	L3	3.1.6	The open loop transfer function of a feedback system is given by $$G(S)H(S) = \frac{K}{S(S+4)(S^2+4S+20)}$$ Sketch the complete root locus and determine the stability of the system.	10
				OR	
11	3	L3	3.1.6	Design a suitable lead compensator for a system having open loop transfer function $$G(S)H(S) = \frac{K}{S(S+1)(S+4)}$$ to meet the following requirements. $\omega_n = 2$ r/s, $\xi = 0.5$ and $k_v \geq 1.5$	10

12 (A)	4	L3	2.4.1	Examine the controllability of the system having $$A = \begin{bmatrix} 0 & 1 & -3 \\ 2 & -5 & 4 \\ -8 & 6 & 7 \end{bmatrix} \; B = \begin{bmatrix} 0 & -2 \\ 1 & -4 \\ 5 & -3 \end{bmatrix}$$	05
12 (B)	4	L3	2.4.1	Examine the observability of the system having $$A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & -2 & 1 \\ 0 & 0 & -1 \end{bmatrix} \; B = \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix} \; C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}$$	05
				OR	
13 (A)	4	L3	2.2.1	Design the controller using pole placement technique so that the closed loop poles are placed at -5 ± j2. The system is described by $$A = \begin{bmatrix} 0 & 3 \\ 2 & 4 \end{bmatrix} \; B = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$$	05
13 (B)	4	L3	2.2.1	Design observer for the following system to have, $t_s = 0.8$ sec and % $M_P = 16.3$ $$\dot{x}_1 = \begin{bmatrix} 0 & 1 \\ -3 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$ $$y = \begin{bmatrix} 0 & 1 \end{bmatrix} x$$	05

Q. No.	CO	CD	PI	QUESTION	MARKS
14	2	L3	3.1.6	Construct the Bode plot of the system having $G(S)H(S) = \dfrac{80}{S(S+2)(S+20)}$ Determine GM, PM, ω_{gc} and ω_{pc}	10
OR					
15	2	L3	3.1.6	Construct the Nyquist's plot of the system having $G(S)H(S) = \dfrac{K}{S(S+1)(S+2)}$ Find the range of values of K for which the closed loop system is stable.	10

Course Outcome (CO): At the end of the course the students will have the ability to	
CO–1	Explain the physical systems as mathematical model.
CO–2	Analyze various properties of the control systems in time domain and frequency domain using appropriate tools.
CO–3	Design and test the controllers for transfer function and state-space models.
CO–4	Evaluate the state-space models of systems using appropriate tools.
CO–5	Demonstrate the performance of controllers using modern tools.

Performance Indicators	
1.1.2	Apply concepts of Complex Variable, probability, linear algebra, vector integration and transformation techniques to model and Solve electronics engineering problems.
2.2.1	Reframe complex problems into interconnected sub-problems.
2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate in terms of applicability and required accuracy.
2.4.1	Apply engineering mathematics to implement solution
2.4.2	Analyze and interpret the results using contemporary tools.
3.1.6	Determine design, objectives, functional requirements and arrive at specifications

Cognitive Domain (CD)	
Level	Domain
L-1	Remember
L-2	Understand
L-3	Apply
L-4	Analyze
L-5	Evaluate
L-6	Create

--- End ---

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20EC540

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

V Semester B.E. Degree Examination

Department of Electronics and Communication Engineering

Digital Signal Processing

Duration: 3 Hours

Max. Marks: 100

NOTE: a) Part A is Compulsory.
b) Answer Part B by making use of internal choice.

PART – A

Q.NO	CO	CD	PI	QUESTION	MARKS
1. a)	1	L3	1.4.1	Compute 4 point DFT of the sequence $x(n) = \{0, 1, 2, 1\}$, Sketch magnitude and phase spectrum.	04
b)	1	L3	1.4.1	Compute Circular convolution of the following sequences using time domain approach. Verify the result using frequency domain approach. $x_1(n) = \{0,1,0,1\}$ $x_2(n) = \{1,2,1,2\}$	06
2.	2	L3	2.1.3	Find $y(n) = x(n)*h(n)$ using overlap–save method. Verify the result by direct computation. $h(n) = \{1, 1, 1\}$ $x(n) = \{1, 2, 0, -3, 4, 2, -1, 1, -2, 3, 4, 2, 1, -3\}$	10
3a)	3	L2	2.4.1	Derive the expressions for determining order N, cut off frequency Ω_c and poles of an analog low pass Butterworth filter.	05
b)	3	L2	2.4.1	Determine the transfer function of normalized fourth order analog Butterworth filter.	05
4.a)	3	L2	2.4.1	List the advantages and disadvantages of using windowing technique in design of FIR filters.	04
b)	3	L2	2.4.1	Give a comparison between FIR and IIR filters.	06

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5.a)	3	L3	3.4.1	Realize FIR filter with impulse response h(n) given by $h(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-4)]$ using Direct Form-I.	05
b)	3	L3	3.4.1	Obtain Linear Phase structure for the following FIR filter. $h(n) = \delta(n) - \frac{1}{4}\delta(n-1) + \frac{1}{2}\delta(n-2) + \frac{1}{2}\delta(n-3) - \frac{1}{4}\delta(n-4) + \delta(n-5)$	05

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6	1	L3	1.4.1	Find Y(K) if $y(n) = x_1(n).x_2(n)$. Take $x_1(n) = \{1,1,1,1,1,1,1,1,\}$ *and* $x_2(n) = Cos(0.25\pi n), 0 \le n \le 7$	10
OR					
7a)	1	L3	1.4.1	For the sequence $x(n) = \{1, 2, 0, 3, -2, 4, 7, 5\}$, Evaluate the following $i)\ X(0)\quad ii) X(4)\quad iii) \sum_{k=0}^{7} X(K)\quad iv) \sum_{k=0}^{7} \lvert X(K)\rvert^2$	04
b)	1	L3	1.4.1	Given the finite length sequence $x(n) = 2\delta(n) + \delta(n-1) + \delta(n-3)$, Find the following i) 5 point DFT X(K) ii) 5 point inverse DFT of Y(K) = X^2(K) for n=0,1,2,3,4.	06

8	2	L2	2.1.3	Develop Radix-3 DIT FFT algorithm for evaluating DFT for N=9. Show all the equations clearly. Draw the complete Signal flow graph.	10
OR					

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9	2	L2	2.1.3	Develop DIT FFT algorithm for evaluating DFT for N=6= 3X2.Using the Signal flow graph, find 6 point DFT of the sequence x(n) ={1, 2, 3, 4, 5, 6}.	10

10	3	L3	2.4.1	Design a digital Butterworth filter to meet the following specifications. Use Bilinear transformation with T=2 sec. $0.9 \leq \lvert H(\omega)\rvert \leq 1 \quad 0 \leq \omega \leq \frac{\pi}{2}$ $\lvert H(\omega)\rvert \leq 0.2 \quad \frac{3\pi}{4} \leq \omega \leq \pi$	10
OR					
11	3	L3	2.4.1	Design a digital Chebyshev filter to meet the following specifications. Use Impulse Invariant Transformation with T=1 Sec. ω_p =0.162 rad, ω_s = 1.63 rad Passband ripple = 3 dB and Stop band attenuation ≥ 30 dB.	10

12	3	L3	2.4.1	Design a band pass linear phase FIR filter having cutoff frequencies $\omega_{c1} = 1\, rad/sample$ and $\omega_{c2} = 2\, rad/sample$. Use Rectangular window with N=7. Also obtain magnitude of the frequency response.	10
OR					
13	3	L3	2.4.1	Design a low pass FIR filter using frequency sampling technique whose cutoff frequency is $\frac{\pi}{2}$ rad. The filter should have linear phase and length 17.	10

14	3	L3	3.4.1	Obtain a) Direct Form –I b) Direct Form –II c) Transposed Direct Form-II d) Cascade e) Parallel forms of realization for the following IIR System	10

				$$H(Z) = \frac{1 + Z^{-1}}{(1+\frac{1}{2}Z^{-1})(1+\frac{1}{2}Z^{-1}+\frac{1}{4}Z^{-2})}$$	
OR					
15	3	L3	3.4.1	Given the FIR filter described by the following difference equation y(n) = x(n) + 3.1 x(n-1) +5.5 x(n-2) +4.2 x(n-3) + 2.3 x(n-4), Obtain Lattice realization of the System.	10

Course Outcome: At the end of the course the students will have the ability to	
CO–1	Perceive discrete-time signals in the frequency domain and its properties, using discrete Fourier transform.
CO–2	Compute DFT using FFT algorithms
CO–3	Analyze, design and realize digital filters for the given specifications
CO–4	Implement the applications of Digital Signal Processing algorithms using computer aided tool

Coginitive Domains:

L1	Remember	L4	Analyze
L2	Understand	L5	Evaluate
L3	Apply	L6	Create

Performance Indicator:

1.4.1	Apply electronics engineering concepts to solve engineering problems
2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
2.2.4	Compare and contrast alternative solution/methods to select the best methods
2.4.1	Apply engineering mathematics to implement solution
3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)

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JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

V Semester B. E. Degree Examination
Department of Electronics and Communication Engineering
DATA STRUCTURES AND ALGORITHMS

Duration: 3 Hours Max. Marks: 100

NOTE: 1) PART-A is compulsory 2) PART-B to be solved according to internal choice.

PART – A

Q.NO	CO	CD	PI	QUESTION	MARKS
1.	CO1	L2	1.3.1	Explain the concepts of polymorphism, inheritance, constructor and destructor with examples.	10
2.	CO2	L2	1.3.1	Discuss various components of space complexity and time complexity.	10
3.	CO2	L2	1.3.1	Compare linked linear list and circular list with respect to their advantages and disadvantages.	10
4.	CO3	L2	1.3.1	State four properties of binary tree. Prove any two of them.	10
5.	CO3	L3	2.1.3	Write and explain the pseudocode for depth first search graph traversal algorithm. Apply the same for graph shown in Figure 5, by considering S as starting node.	10

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6	CO1	L3	1.4.1, 2.1.3	Explain the advantages of operator overloading in C++. Demonstrate the same by writing the code in C++ for adding two complex numbers by defining the class Complex and by overloading the '+' operator.	10
				OR	
7	CO1	L3	1.3.1	Distinguish data encapsulation and data hiding with appropriate example and its C++ code.	10

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8	CO2	L2	1.3.1	Explain the concept of stack and its operations. Distinguish class *stack* and class *arraystack*.	10
OR					
9	CO2	L3	2.1.3	List any five differences between Stacks and Queues. Write a C++ program to reverse a string ALGORITHMS using stack.	10

10	CO2	L3	2.1.3	Write C++ function with respect to single linked list: (a) To insert an element at the middle of the linked list (b)To merge two lists; one list with only odd and another list with only even numbers.	5+5
OR					
11	CO2	L3	2.1.3	Explain three main components of Hashing technique. Given two Linked Lists, using Hashing technique; create union and intersection lists that contain union and intersection of the elements present in the given lists. (Order of elements in output lists doesn't matter, C++ code not required)	10

12	CO3	L3	2.1.3	(a)Given two arrays pre[] = {25, 15, 10, 4, 12, 22, 18, 24, 50, 35, 31, 44, 70, 66, 90} and post[] = {4, 12, 10, 18, 24, 22, 15, 31, 44, 35, 66, 90, 70, 50, 25}, that represent preorder and postorder traversals of a full binary tree, construct the binary tree. (b) Construct an Expression tree for the following expression a^b+c/d*e-f+g/h	6+4
OR					
13	CO3	L3	2.1.3	(a) Obtain the preorder, post order and inorder traversal for the tree shown in Figure 13. (b) Define AVL Tree. List its advantages.	6+4

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14	CO3	L3	2.2.2	Write the steps of Dijkstra algorithm, apply the same to find the shortest path from S node to all the other nodes for the graph shown in Figure 14. Show all the intermittent steps.	10
OR					
15	CO3	L3	2.2.2	Write and explain the steps for breadth first search graph traversal algorithm. Apply the same for graph shown in Figure 5, by considering S as starting node.	10

Course Outcome: At the end of the course the students will have the ability to	
CO–1	Explain programming skills through Object Oriented Programming(OOP) and accessing different types of data structures
CO–2	Apply programming skills through OOPs and efficient storage mechanisms of data for an easy access
CO–3	To design, evaluate and implementation of various basic and advanced data structures for skill enhancement in problem solving and develop applications.
CO–4	Develop and demonstrate innovative programming solutions/ Refine available solutions by improving the existing code and select algorithm design approaches in a problem specific manner.

Performance Indicator:

1.3.1	Apply Engineering fundamentals
1.4.1	Articulate problem statements and identify objectives.
2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
2.2.2	Identify existing solution/methods for solving the problem, including forming justified approximations and assumptions

--- End ---

3

20EC550 DATA STRUCTURES AND ALGORITHMS

SEE FIGURES

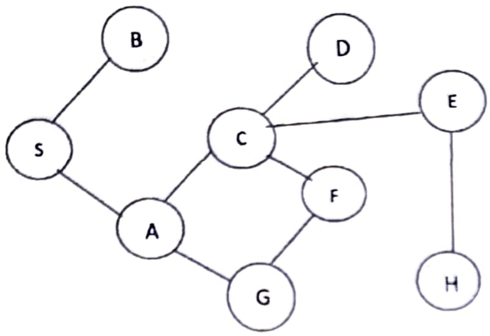

Figure 5 for Q5, Q15

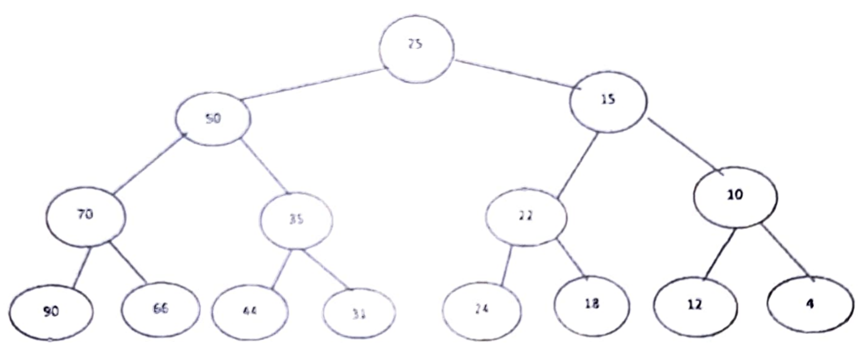

Figure 13

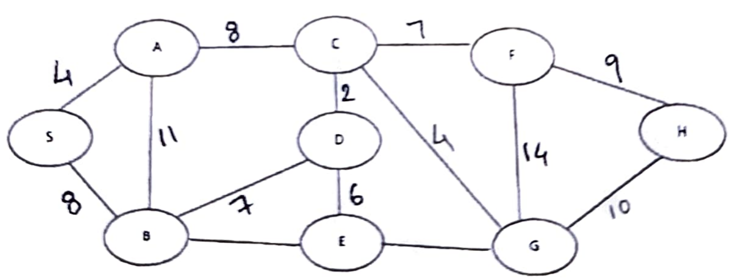

Figure 14