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Learn Research Innovate

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

II YEAR

ODD SEMESTER

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HoD **ACOE** **PRINCIPAL** **CHAIRMAN**

INDEX

MA3355
RANDOM PROCESSES AND LINEAR ALGEBRA

UNIT I

PROBABILITY ANDRANDOM VARIABLES

Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous randomvariables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform,ExponentialandNormaldistributions–Functionsofarandomvariable.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the axioms of probability.	1	1	2
2	Find C, if a continuous random variable X has the density function $f(x)=\frac{c}{1+x^2},\ -\infty<x<\infty.$	1	2	2
3.	A continuous random variable X that can assume any value between x=2 and x=5 has a density function given by f(x)= (2/27)(1+x). Find P(X<4).	1	2	2
4.	Show that $M_{X+Y}(t) = M_X(t)\ .\ M_Y(t)$ where X and Y are two independent random variables.	1	1	2
5.	If the moment generating function of a random variable X is, $\frac{1}{1-t}, \lvert t\rvert<1,$ find $E(X)$ and $E(X^2)$.	1	2	2
6.	The mean of Binomial distribution is 20 and standard deviation is 4. Find the parameters of this distribution.	1	2	2
7.	What are the limitations of Poisson distribution?	1	1	2
8.	A random variable X is uniformly distributed between 3 and 15. Find the variance of X.	1	2	2

PART B

1. A random variable X has the following probability distribution (CO 1, BTL 5, Marks 16)

x	0	1	2	3	4	5	6	
P(X=x)	0	K	2K	2K	3K	K^2	$2K^2$	7K

Determine (i) the value of K (ii)P(X<6), P(1<X<5), P(X≥6) and (iii)If P[X≤C]>1/2, then find the minimum value of C.

2. (i) Estimate the moment generating function of a random variable X whose probability function $P(X=x)=\frac{1}{2^x}, x=1,2,\ldots$ Hence find its mean.
(ii) A continuous random variable X has the density function f(x) given by
$P(X=x)=\frac{k}{x^2+1}, -\infty<x<\infty$. Find the value of 'k' and the cumulative distribution of X (CO 1, BTL 5, Marks 16)

3. (i)Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least 1 boy (CO 1, BTL 3, Marks 16)

	(iii)at most 2 girls and (iv) children of both genders. Assume equal probabilities for boys and girls. (ii)State and prove memory less property of Geometric distribution.			
4	(i)The mileage which car owners get with a certain kind of radial tire is a random variable having an exponential distribution with mean 40,000 km. Find the probability that one of these tires will last at least 20,000 km. Also find the probability that one of these tires will last at most 30,000 km. (ii) An electrical firm manufactures light bulbs that have a life before burn-out that is normally distributed with mean equal to 800 hrs and a S.D. of 40 hrs. Determine (a) the probability that a bulb burns more than 834 hrs(b)the probability that a bulb burns between 778 and 834 hrs.	1	3	16

UNIT II

TWO- DIMENSIONAL RANDOM VARIABLES

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and line regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Let X and Y be two independent R.V.s with Var(X)=9 and Var(Y)=3. Find Var(4X-2Y+6).	2	2	2
2	The joint probability mass function of (X, Y) is given by $p(x,y)=k(2x+y), x=1,2$ and y=1,2 where k is a constant. Find the value of k.	2	2	2
3.	The joint p.d.f. of the random variable X and Y is defined as $f(x,y)=\begin{cases}25e^{-5y}, & 0<x<0.2,\ y>0\\ 0 & otherwise\end{cases}$. Find the marginal p.d.f.'s of X and Y.	2	2	2
4.	The joint p.d.f. of the random variable X and Y is defined as $f(x,y)=\begin{cases}1/4, & 0\le x,y\le 2\\ 0 & otherwise\end{cases}$. Find P(x+y≤1).	2	2	2
5.	If X and Y are independent random variables prove that Cov(X, Y) = 0.	2	2	2
6.	The regression equations are x+9y = 7 and y+4x = 49/3. Find the correlation coefficient between X and Y.	2	2	2
7.	Can $y = 5 + 2.8x$ and $x = 3 - 0.5y$ be the estimated regression equation of y on x respectively explain your answer.	2	2	2

		CO	BTL	Marks
8.	State central limit theorem.	2	1	2

PART B

1.	The joint probability mass function of (X, Y) is given by $p(x,y)=k(2x+3y)\ x=0,1,2;\ y=1,2,3.$ Determine all the marginal and conditional probability distributions. Also find the probability distribution of (X+Y) and P(X+Y>3).	2	3	16
2.	The joint p.d.f. of the R.V. (X,Y) is given by $f(x,y)=\begin{cases}\frac{1}{8}(6-x-y)\ ,\ 0<x<2,\ 2<y<4 \\ 0 \quad otherwise\end{cases}$. Estimate (i) P(X < 1 ∩ Y < 3) (ii) P(X + Y < 3) (iii) P (X < 1 / Y < 3).	2	5	16
3.	From the following data estimate (a) the two regression equations (b) the coefficient of correlation between the marks in economics and statistics. (c) the most likely marks in statistics when marks in economics are 30.	2	5	16

x	25	28	35	32	31	36	29	38	34
y	43	46	49	41	36	32	31	30	33

4	The equation of two regression lines are $8x-10y+66=0$ and $40x-18y-214=0$. Find $\bar{x}$, $\bar{y}$ and the correlation co-efficient between X and Y.	2	3	16

UNIT III

RANDOMPROCESSES

Classification–Stationaryprocess–Markovprocess-Poissonprocess-DiscreteparameterMarkov chain–ChapmanKolmogorovequations(Statementonly)-Limitingdistributions

Q.No	Question	CO	BTL	Marks

PART A

1.	Define random process.	3	1	2
2	What is Markov process?	3	1	2
3.	State Chapman Kolmogorov equations.	3	1	2
4.	What is meant by one-step transition probability?	3	1	2
5.	List the postulates of a Poisson process.	3	1	2
6.	Is Poisson process stationary? Justify.	3	1	2
7.	Write any two properties of a Poisson process.	3	1	2

8.	If the customers arrive at a bank according to a Poisson process with mean rate 2 per minute, find the probability that during 1-minute interval no customer arrive.	3	2	2

PART B

1.	(i) Consider the random process $X(t) = \cos(t + \varphi)$, where φ is a random variablewith density function $f(\varphi) = \frac{1}{\pi}, -\frac{\pi}{2} < \varphi < \frac{\pi}{2}$, Identify whether the process is stationary or not. (ii) Show that the random process $X(t) = A\cos(\omega t + \theta)$ is wide sense stationary if A and ω are constants and θ is uniformly distributed random variable in $(0, 2\boldsymbol{\pi})$.	3	4	16
2.	(i)Show that a Poisson process is a Markov process. (ii) If customers arrive at a counter in accordance with a Poisson process with a mean rate of 3 per minute, find the probability that during a time interval of (i) more than 1 minute (ii) between 1 minute and 2 minutes (iii) 4 minutes or less.	3	3	16
3.	(i)A man either drives a car or catches a train to go to office each day. He never goes two days in a row by train. But he drives one day, then the next day he is just as likely to drive again as he is to travel by train. Now suppose that on the first day of the week, the man tossed a fair die and drove to work if and only if a 6 appeared. Find the probability transition matrix. Obtain the probability that he takes a train on the third day. (ii) Find the nature of the states of the Markov chain with the tpm $P = \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{pmatrix}$.	3	3	16
4	The transition probability matrix of a Markov chain { $X(t)$ }, n=1, 2, 3…. having three states 1, 2, 3 is $P = \begin{pmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{pmatrix}$, and the initial distribution is $P^{(0)} = [0.7\ \ 0.2\ \ 0.1]$, find $P(X_2 = 3)$ and $P(X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2)$.	3	3	16

UNIT IV

ANALYSIS OF DISCRETE TIME SIGNALS

Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)– Properties of DTFT - Z Transform & Properties

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Vector Space.	4	1	2
2	Ina vector space V(F)i f $\alpha v = 0$thenprove that either α=0or$v$ = 0.	4	1	2
3.	Show that the vectors{(1,1,0),(1,0,1)and(0,1,1)}generateF^3.	4	2	2
4.	Is $W=\{(a,0,b):a, b\in R\}$asubspaceof$R^3(R)$?	4	2	2
5.	Write the vectors$v$= (1,−2,5) as a linear combination of the vectors$x$=(1,1,1),y= (1,2,3) and z= (2, −1,1)	4	1	2
6.	Determine whether the set W={$(a_1,a_2,a_3)\in R^3$:$a_1+2a_2-3a_3=1$} is a subspace ofR^3undertheoperationsofadditionand scalar multiplication.	4	2	2
7.	If W_1 and W_2 are subspaces of a vector space V(F), having dimensions m and n respectively where m ≥ n prove that $\dim(W_1 \cap W_2) \leq n$.	4	1	2
8.	Find the linear span of $S = \{ (1,0,0),(2,0,0),(3,0,0) \} \in R^3$.	4	2	2
	PART B			
1.	Let Vbe the set of all polynomials of degree less than or equal to n with real coefficients. Show that $V$is a vector space over $R$with respect to polynomial addition and usual multiplication of real numbers with a polynomial.	4	4	16
2.	i) Show that$W=\{(a_1,a_2,a_3)\in R^3; 5a_1^2 - 3a_2^2 + 6a_3^2 = 0$is a subspace. (ii)Let V be a vector space and W a subset of V. Prove that W is a sub space of Vif and only if the following three conditions hold for the operations defined in$V$:a)$0\in W$ b)$x+y\in W$whenever$x\in W$and $y\in W$ c)$cx\in W$whenever $c\in F$ and $x\in W$.	4	4	16

3.	In R^3 over R, test whether (a)(2, -5, 4) is a linear combination of the vectors (1, -3, 2) and (2, -1, 1) (b) (1, -2, 5) is a linear combination of (1, 1, 1), (1, 2, 3), (2, -1, 1).	4	4	16
4	Test whether the indicated vector is in the linear span of S. (a)(2, -1, 1), $S = \{(1, 0, 2), (-1, 1, 1)\}$ in $R^3(R)$ (b) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, S = \left\{ \begin{bmatrix} 1 & 0 \\ -1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix} \right\}$, in $M_2(R)$	4	4	16

UNIT V

LINEAR TRANSFORMATION AND INNER PRODUCT SPACES

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of alinear transformations - Inner product - Norms - Gram Schmid orthogonalization process – Adjoin of linear operations-Least square approximation.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	If $T:V \to W$ be a linear transformation then prove that $T(-v)=-v$ for $v \in V$	5	1	2
2	Is there a linear transformation $T:R^2 \to R^2$ suchthat (1,0,3) = (1,1)and (−2, 0, −6) = (2,1)?	5	2	2
3.	Is $T:R^3(R) \to R^3(R)$ –defined by $T(x, y, z)=(x, 0,0)$ a linear transformation?	5	2	2
4.	State Gram-Schmidt theorem.	5	1	2
5.	Define matrix representation of T relative to the usual basis {ei}.	5	1	2
6.	Define inner Product Space and give its axioms.	5	1	2
7.	Define Kernel of T.	5	1	2
8.	If $x = (2, 1 + i, i)$ and $y = (2 - i, 2, 1 + 2i)$ are the vectors in C^3, compute $< x, y >$.	5	2	2
	PART B			
1.	(i)State and prove dimension theorem. (ii)Find the linear transformation $T : V_3(R) \to V_3(R)$	5	4	16

determined by the matrix $\begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ -1 & 3 & 4 \end{pmatrix}$ write the standard basis $\{e_1, e_2, e_3\}$.

2.	Let $T: R^3 \rightarrow R^2$ defined by $(x,y,z) = \{2x-y, 3z\}$. Verify T is linear or not. Find $N(T)$ and $R(T)$. Hence verify dimension theorem.	5	4	16
3.	State and prove Gram Schmidt Orthogonalisation process.	5	4	16
4	Using least square approximation determine the best linear fit for the data { (1,2), (2,3), (3,5), (4,7) }.	5	4	16

*****END*****

CS3353

C PROGRAMMING AND DATA STRUCTURES

UNIT I

C PROGRAMMING FUNDAMENTALS

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are Ternary operators or Conditional operators? (or) Give an Example for Ternary operator.	1	1	2
2.	What is the difference between while loop and do…while loop?	1	1	2
3.	What are the I/O Functions in C?	1	1	2
4.	Write a for loop statement to print numbers from 10 to 1.	1	1	2
5.	What is an array? Give an example	1	1	2
6.	What are the main elements of an array declaration?	1	1	2
7.	Difference between formatted and unformatted input statements. Give one example for each.	1	2	2
8.	What is external storage class?	1	1	2
	PART B			
1.	Explain the different types of operators used in C with necessary program.	1	2	16
2.	What is the purpose of looping statement? Explain in detail the operations of various looping statement with examples.	1	2	16
3.	Describe the structure of a C program using "Calculator program" example.	1	2	16
4.	Write the C program to multiply two matrices (two-dimensional array) which will be entered by a user. The user will enter the order of a matrix and then its elements and similarly input the second matrix. If the entered orders of two matrices are such that they can"t be multiplied by each other, then an error message is displayed on the screen.	1	2	16

UNIT II

C PROGRAMMING - ADVANCED FEATURES

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions– File Handling – Preprocessor Directives

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is a Pointer? How a variable is declared to the pointer?	2	1	2
2.	What is the difference between NULL and NUL?	2	2	2
3.	What is the difference between an array and pointer?	2	1	2
4.	What is Pointer Arithmetic?	2	1	2
5.	What is the difference between far and near pointers?	2	2	2
6.	What is the need for functions?	2	1	2
7.	List the advantage of recursion.	2	1	2
8.	What is the use of pre-processor directives?	2	1	2
	PART B			
1.	What do you mean by Call by reference and Call by value? Explain with an example.	2	2	16
2.	How do you use a pointer to a function? When would you use a pointer to a function?	2	2	16
3.	i) Write a C program to generate Fibonacci series using function. ii) Write a C Program to find factorial of a given number using recursive function.	2	2	8+8
4.	i) Explain the purpose of a function prototype. And specify the difference between theuser defined function and built-in function. ii) Write the C program to find the value of sin(x) using the series up to the given accuracy (without using user defined function) also print sin(x) using library function.	2	2	8+8

UNIT III

LINEAR DATA STRUCTURES

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Abstract Data Type (ADT). What are operations of ADT?	3	1	2
2.	Define linked list.	3	1	2
3.	Give the comparison between array and linked list.	3	1	2
4.	List out the advantages of linked lists.	3	1	2
5.	What are the operations can we perform on a linked list?	3	1	2
6.	What is circular linked list?	3	1	2
7.	What is static linked list? State any two applications of it.	3	1	2
8.	Illustrate the difference between Linear Linked List and Circular Linked List.	3	1	2
	PART B			
1.	Write a C code for singly linked list with insert, delete, and display operations usingstructure pointers.	3	2	16
2.	Describe the creation of a doubly linked list and appending the list. Give relevant coding C.	3	2	16
3.	Write a C program to perform addition, subtraction and multiplication operations onpolynomial using linked list.	3	2	16
4.	Define data abstraction. Write the ADT for the data structure in which the same condition can used appropriately, for checking overflow and underflow. Define all basic functions of this ADT.	3	2	16

UNIT IV

NON-LINEAR DATA STRUCTURES

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define node, degree, siblings, depth/height, and level.	4	1	2
2.	Define a Binary Search Tree.	4	1	2
3.	Define balanced search tree.	4	1	2
4.	Define AVL tree.	4	1	2
5.	What is a heap? Or Illustrate Heap Data Structure.	4	1	2
6.	Define B-tree?	4	1	2
7.	Explain AVL rotation. Mention the two types of rotations	4	2	2
8.	How to resolve dangling threads in binary tree? Illustrate.	4	1	2
	PART B			
1.	What is traversal? Give an algorithm for traversal in the binary tree.	4	2	16
2.	Draw a Binary search tree for the following input list 60,25,75,15,50,66,33,44.Trace the algorithm to delete the nodes 25, 75, 44 from the tree.	4	2	16
3.	i) Write a routine for AVL tree insertion. Insert the following elements in the empty tree and how do you balance the tree after each element insertion? Elements : 2,5,4,6,7,9,8,3,1,10. ii) Discuss about B+ tree. And discuss the applications of heap.	4	3	16
4.	Construct B tree to insert the following key elements with order 5. 2, 14, 12, 4, 22, 8, 16, 26, 20, 10, 38, 18, 36, 48, 6, 24, 28, 40, 42, 32.	4	3	16

UNIT V

SORTING AND SEARCHING TECHNIQUES

Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is the best case and Average case analysis of shell sort?	5	1	2
2.	What is meant by external sorting?	5	1	2
3.	What is meant by selection sort? Or What are the steps involved in performing selection sort?	5	1	2
4.	What is meant by Shell sort?	5	1	2
5.	What is meant by Radix Sort? Or Define Radix Sort.	5	1	2
6.	Explain Hash Function.	5	2	2
7.	Mention Different types of collision resolving techniques.	5	1	2
8.	What are the advantage and disadvantage of separate chaining and linear probing?	5	1	2
	PART B			
1.	Explain the algorithm to perform Heap Sort with Example.	5	2	16
2.	State and explain the shell sort. State and explain the algorithm for shell sort. Sort the elements using shell sort.	5	2	16
3.	i) Write a function to perform merge sort. Give example. ii) Write a routine for insertion sort. Sort the following sequence using insertion sort.3, 10, 4, 2, 8, 6, 5, 1	5	3	16
4.	Distinguish between linear search and binary search. State and explain the algorithms for both the search with example.	5	3	16

END

EC3354

SIGNALS AND SYSTEMS

UNIT I

CLASSIFICATION OF SIGNALS AND SYSTEMS

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant& Time-invariant, Causal & Non-causal, Stable & Unstable.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Give the conditions for a system to be linear and time invariant.	1	2	2
2.	Determine whether the signal x (t) = cos (2πt) is periodic or not.	1	2	2
3.	State whether the following system y (t) =2tx (t) is time variant or not.	1	3	2
4.	Differentiate between causal and non-causal systems.	1	1	2
5.	Define continuous and discrete time signals.	1	1	2
6.	Distinguish between deterministic and random signals.	1	2	2
7.	Define even and odd signal.	1	1	2
8.	Determine whether the signal x(n)is periodic. If yes find its fundamental period x (t)=je^{j10t}.	1	2	2
	PART B			
1.	(i) Determine whether the system y (t) =10x (t) +5 is static, linear, time invariant, causal and stable or not.	1	2	8
	(ii) Give the detailed classification of signals with examples for each of the category.	2	8	
2.	(i) Determine the periodicity of the following continuous time signals. a)x(t)= 2 cos 3t+3 sin 7t b)x(t)= 5 cos 4πt+3 sin 8πt	1	2	8
	(ii)Test whether the system is linear or not. $d^2y(t) / dt^2 + 2\, dy(t)/dt + 3\, y(t) = x(t)$		3	8
3	Explain all classification of systems with examples for each category.	1	3	8
	For the given x (n) = {1, 4, 3,-1, 2}, Plot the following			8

	signals. a) $x(-n-1)$ b) $x(-n/2)$ c) $x(-n/2)+2$			
4.	Check the property (i)Time variant Or Invariant n $y(n) = x(n) \cos(\omega_0 n)$ (ii) $y(n) = n\,x(n) + bx^2(n)$.Check whether it is static or dynamic. (iii) $y(t) = x(3-t)$.Check the linearity property. (iv) $\frac{d}{dt} y(t) + t\,y(t) = x(t)$. Check the causality property.	1	2	16

UNIT II

ANALYSIS OF CONTINUOUS TIME SIGNALS

Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State Dirichlet conditions for the existence of Fourier series and Fourier transform.	2	1	2
2.	Obtain the Continuous Time Fourier Transform of the impulse function.	2	1	2
3.	Define Fourier transform.	2	1	2
4.	If $X(s)=\frac{2}{(s+3)}$. Find the Laplace transform of $\frac{dx(t)}{dt}$.	2	2	2
5.	Write the pair equations of the Fourier series of a periodic continuous time signals.	2	2	2
6.	Recall the initial and final value theorems of Laplace Transform.	2	1	2
7.	Draw the ROC of the Laplace transform of a signal $x(t)=e^{at} u(-t)$	2	1	2
8.	Obtain the Fourier transform of following functions (i) $x(t) = \cos \omega_c t$ (ii) $x(t) = \sin \omega_c t$	2	2	2
	PART B			
1.	Find the continuous time Fourier transform of the signal $x(t) = A \cos(2\pi f_c t)\, u(t)$ and plot its amplitude spectrum. (ii)Find the inverse Laplace transform of the function	2	2	16

$$X(S) = \frac{1}{S^2 + 3S + 2}$$ With ROC as :2<Re(S)< -1

2.	(i)Derive the Fourier transform expression from the exponential form of Fourier series. (ii) State and prove initial value theorem and final value theorem using Laplace Transform.	2	2	16
3.	(i)Determine the Fourier series representation of $x(t)=2\sin(2\pi t-3)+\sin 6\pi t$. (ii)Find the Fourier transform of the signal $x(t)=e^{2t}u(-t)$	2	1	16
4.	Determine the Laplace transform of x(t)=e at u(t) and depict he ROC and the locations of poles and zeros in the s plane. Assume that a is real.	2	1	16

UNIT III

LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Write the convolution property and final value theorem of Laplace transform.	3	2	2
2.	What is the relationship between Fourier transform and Laplacetransform?	3	1	2
3.	Determine the impulse response h (t) of the following system y (t) =x (t-t_0).Assume zero initial conditions.	3	2	2
4.	Perform convolution of the causal signal X1(t) =2u (t), x2(t) =u (t) using Laplace transform.	3	1	2
5.	Define impulse response.	3	2	2
6.	State the condition for an LTI system to be stable.	3	1	2
7.	Find the step response of a LTI system with impulse response $h(t)=\delta(t)-\delta(t-1)$.	3	1	2
8.	Define convolution Integral. List the properties of convolution Integral.	3	1	2
	PART B			
1.	(i) The differential equation of the system is given as, $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=-\frac{dx(t)}{dt}$. Using Fourier transform determine the impulse response of the system.	3	2	8

	(ii) The system transfer function is given as, $H(S)=\frac{S}{S^2+5S+6}$. The input to the system is $x(t)=e^{-t}u(t)$. Determine the output assuming zero initial conditions.			8
2.	(i)Explain the cascade structure and parallel structure of continuous time systems with neat diagram.	3	2	8
	(ii)Perform convolution of $x_1(t)=e^{-2t}\cos 3t\, u(t)$ and $x_2(t)=4\sin 3t\, u(t)$ Using Laplace transform.			8
3.	(i)The input and output of a causal LTI system are related by the differential equatic $\frac{d^2y(t)}{dt^2}+6\frac{dy(t)}{dt}+8y(t)=2x(t)$	3	2	8
	Find the impulse response h (t) and the output response y (t) of the system when x (t) =u (t). (ii)Explain the properties of convolution integral			8
4.	Realize the system with transfer function in cascade form $H(s)=\frac{4(s^2+4s+3)}{s^3+6.5s^2+11s+4}$	3	2	16

UNIT IV

ANALYSIS OF DISCRETE TIME SIGNALS

Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the sampling theorem for baseband signals.	4	1	2
2.	Prove Pareseval's theorem using Discrete Time Fourier Transform.	4	2	2
3.	Compare Fourier transform of discrete discrete and continuous time signals.	4	1	2
4.	State the linearity property of Z transform.	4	1	2
5.	What is aliasing?	4	1	2

6.	State any two properties of DTFT.	4	2	2
7.	Mention the effects of aliasing.	4	1	2
8.	Determine the system function of the discrete time system described by the difference equation $y[n]-\frac{1}{2}y[n-1]+\frac{1}{4}y[n-2]=x[n]-x[n-1]$	4	2	2

PART B

1.	(i)Identify and explain the following properties of discrete time Fourier transform. a)Differentiation in frequency domain b)Time reversal c) Convolution. (ii) a) Explain the relationship between Fourier transform and z transform. b) Explain the time shifting and differentiation in z domain property of z transform.	4	1	16
2.	(i)Explain the correlation property and Parseval's relation in DTFT. (ii)Find the one sided z transform of the discrete time signals generated by mathematically sampling the following continuous time signal x(t)= $x(t)=e^{-at}\cos\Omega_0 t$.	4	1	16
3	Consider an LTI system with input x(n) and y(n) for which $y[n-1]-\frac{5}{2}y[n]+y[n+1]=x[n]$. This system may or may not be stable or causal.By considering pole zero pattern of the difference equation determine the three possible choices for the unit sample response of the system and prove that each choices satisfies the difference equation.	4	2	8
4.	State and prove sampling theorem for a band limited signal.	4	1	16

UNIT V

LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS

Impulse response–Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the properties of Linear convolution.	5	1	2
2.	What are recursive and non-recursive systems? Differentiate between recursive and non-recursive systems.	5	1	2
3.	In an LTI system the impulse response h (n) =C^n for n≤0.Determine the range of values of C for which the system is stable.	5	6	2
4.	List the condition for an LTI system to be causal.	5	2	2
5.	Define convolution sum and List the steps involved in finding the convolution sum.	5	1	2
6.	State the relation between Fourier transform and Z transform.	5	4	2
7.	Define system function.	5	1	2
8.	If u (n) is the impulse response of the system, what is the step response?	5	1	2
	PART B			
1.	(i)A difference equation of the system is given as $y(n)=0.5\ y(n-1)+x(n)$. Determine a) Systemfunction b) Pole zero plot of the system function c) Unit sample response of the system.	5	2	8
	(ii) Obtain direct form-I and direct form-II realization of the following system $y(n)=0.75\,y(n-1)-0.125\,y(n-2)+6x(n)+7x(n-1)+x(n-2)$.			8
2.	(i)Find the transfer function and unit sample response of the second order difference equation with zero initial conditions y (n) =x (n)-0.25y (n-2).	5	2	16

(ii)Find the linear convolution of the sequence

$x(n)=\{-1, 1, \underset{\uparrow}{2}, -2\}$ & $h(n)=\{0.5, 1, \underset{\uparrow}{-1}, 2, 0.75\}$

3.	(i)Evaluate the discrete time convolution sum of the following $$y(n)=\left(\frac{1}{4}\right)^n u(n) * u(n+2).$$	5	2	8
	(ii)Determine the transfer function and the impulse response for the causal LTI system described by the difference equation $$y(n)=\frac{1}{4}y(n-1)-\frac{3}{8}y(n-2)=-x(n)+2x(n-1).$$			8
4.	Consider a discrete time LTI system $$y[n]-\frac{3}{2}y[n-1]+\frac{1}{2}y[n-2]=2x[n]+\frac{3}{2}x[n-1] \text{ where}$$ $$y[-1]=0,\ y[-2]=1 \text{ and } x[n]=\left(\frac{1}{4}\right)^n u(n)$$ Find output response using Z-transform. Draw its ROC of the transfer function and comment its causality of the system.	5	2	16

*****END*****

EC3353

ELECTRONIC DEVICES AND CIRCUITS

UNIT I
SEMICONDUCTOR DEVICES

PN junction diode, Zener diode, BJT, MOSFET, UJT –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define depletion region and breakdown voltage of zener diode.	1	1	2
2.	Draw the symbol of diode, zener diode, BJT and UJT.	1	1	2
3.	A Ge diode has a saturation current of 10µA at 300o K. Find the saturation current of 400^{o} K.	1	1	2
4.	A full wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20Ω. The transformer rms secondary voltage from centre tap to each end of secondary is 50 V and the load resistance is 980 Ω. Evaluate (a) mean load current and (b) the rms value of load current.	1	2	2
5.	What are the applications of LED, PN diode and zener diode?	1	1	2
6.	Define drift current, diffusion capacitance, transition capacitance and doping.	1	1	2
7.	Differentiate between the breakdown voltage and Peak Inverse Voltage of a PN diode.	1	2	2
8.	Define Knee Voltage of a diode.	1	1	2
	PART B			
1.	Explain the working and VI characteristics of PN junction diode and zener diode.	1	2	16
2.	Explain the working of full wave rectifier and derive its Average voltage, RMS voltage, Peak factor, Form factor, Ripple factor and efficiency.	1	2	16
3.	(i) How is zener diode used as voltage regulator? Explain the working principle of zener voltage regulator? (ii) Describe the UJT, working theory and ways in which they differ from BJTs.	1	2	16
4.	Explain the working principle, operation and VI characteristics of MOSFET, BJT and UJT.	1	2	16

UNIT II

AMPLIFIERS

Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model–Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Name the factors that affect stability of Q point of a transistor amplifier.	2	1	2
2.	Define current amplification factor and stability factor.	2	1	2
3.	What is the need for biasing in transistor amplifier?	2	1	2
4.	An amplifier operating from + or – 3 V and provide a 2.2 V peak sine wave across a 100 Ω load when provide with a 0.2 V peak sine wave as an input from which 1 mA current is drawn. The average current in each supply is measured to be a 20 mA. What is the amplifier efficiency?	2	2	2
5.	What is a Q-point and thermal runway?	2	1	2
6.	Compare bias stabilization and compensation techniques.	2	2	2
7.	What are the types of transistor biasing and explain its?	2	1	2
8.	List out the importance of selecting the proper operating point.	2	1	2
	PART B			
1.	(i) Explain the fixed bias circuit for BJT. Discuss the merits and demerits of fixed bias circuit. (ii) Explain the voltage divider biasing for MOSFET.	2	2	16
2.	Derive an expression for current gain, voltage gain, input impedance and output admittance for a BJT low frequency h-parameter model for (i) CE configuration (ii) CB configuration and (iii) CC configuration.	2	4	16
3.	(i) Give the MOSFET small signal model. (ii) Analyze CS amplifier for finding voltage gain, input impedance and output impedance.	2	4	16
4.	(i) Explain the operation of power transistor. (ii) Explain any two applications of BJT.	2	2	16

UNIT III

MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIERS

Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response – Neutralization methods.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Find the Q-factor value of a tuned circuit with resonant frequency of 1600 KHz and the bandwidth of 10 KHz.	3	1	2
2.	Define CMRR. Give its ideal value.	3	1	2
3.	List out various coupling methods for multistage amplifiers. List out some of the applications of tuned amplifier.	3	1	2
4.	List out some of the features of Differential amplifier and various configuration of differential amplifier.	3	1	2
5.	Which type of connection is made for cascode amplifier?	3	1	2
6.	Write the hybrid parameters equation for transistor amplifier?	3	1	2
7.	What is BiCMOS amplifier? What is a tuned amplifier?	3	1	2
8.	What is the need for neutralization method in tuned amplifiers? List out the advantages and disadvantages of tuned amplifier.	3	1	2
	PART B			
1.	(i) Explain the BJT based cascode amplifier and its advantages. (ii) Explain the working of differential amplifier and derive the expression for CMRR.	2	2	16
2.	An amplifier rated at 40 W output is connected to a 10 Ω speaker. (i) Calculate the input power required for full power output if the power gain is 25 dB (ii) Calculate the input voltage for rated output if the amplifier voltage gain is 40 dB.	2	4	16
3.	Why neutralization is needed and explains the Hazeltine neutralization method.	2	2	16
4.	Explain different methods used for coupling multistage amplifiers with their frequency response.	2	2	16

UNIT IV

FEEDBACK AMPLIFIER AND OSCILLATOR

Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response – Neutralization methods.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define piezoelectric effect. Define sampling and mixing.	4	1	2
2.	State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity?	4	1	2
3.	What is feedback amplifier and give its types? What is transition and diffusion capacitance?	4	1	2
4.	List the advantages of negative feedback amplifiers. List out the steps to improve frequency stability.	4	1	2
5.	Describe the characteristics of Negative feedback. Describe the characteristics of Positive feedback.	4	1	2
6.	What are the factors needed to choose type of oscillators? What are the advantages of crystal oscillator?	4	1	2
7.	What are the necessary conditions for oscillation?	4	1	2
8.	Define frequency stability of Oscillator.	4	1	2
	PART B			
1.	(i) Draw the block diagram of voltage series feedback amplifier and derive the equation for input impedance, voltage gain and output impedance. (ii) Draw the block diagram of voltage shunt and current series feedback amplifier and derive the equation for input impedance, voltage gain and output impedance.	4	2	16
2.	With neat diagram and explain the RC phase shift oscillator. Derive the frequency of oscillation.	4	2	16
3.	With neat diagram and explain the Wien bridge oscillator. Derive the frequency of oscillation.	4	2	16
4.	Draw and explain the Hartley and colpitts oscillator. Derive the frequency of oscillation.	4	2	16

UNIT V

POWER AMPLIFIERS AND DC/DC CONVERTERS

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is a DC to DC converter? What is power amplifier?	5	1	2
2.	Define the following modes of operation (a) Class AB (b) Class C.	5	1	2
3.	List out the functions of DC-DC converters. List out the various configurations of switched mode DC to DC converters.	5	1	2
4.	State the advantages and disadvantages of complementary symmetry class B power amplifier. List out some of the advantages and disadvantages of step down switching regulator.	5	1	2
5.	What is cross-over distortion? How it can be eliminated?	5	1	2
6.	Define class A operation of power amplifier.	5	1	2
7.	Differentiate Buck and Boost converter.	5	2	2
8.	What are the features of power amplifier? What are the types of distortion?	5	1	2
	PART B			
1.	With neat diagram and explain the working of class AB power amplifier using power MOSFET and state the advantages of using power MOSFET over BJT.	5	2	16
2.	In an amplifier, the output power is 1.5 W at 2 KHz and 0.3 W at 20 Hz, while the input power is constant at 10 mW. Calculate by how many decibels gain at 20 Hz is below that at 2 KHz.	5	4	16
3.	What is boost converter and buck converter? How does a buck-boost circuit work?	5	2	16
4.	With neat diagram, derive the expression for output voltage of a buck – boost converter.	5	2	16

*****END*****

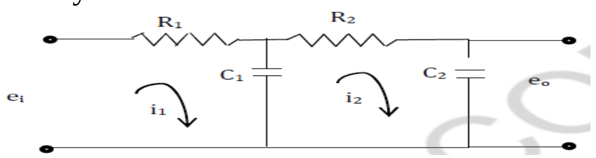
EC3351

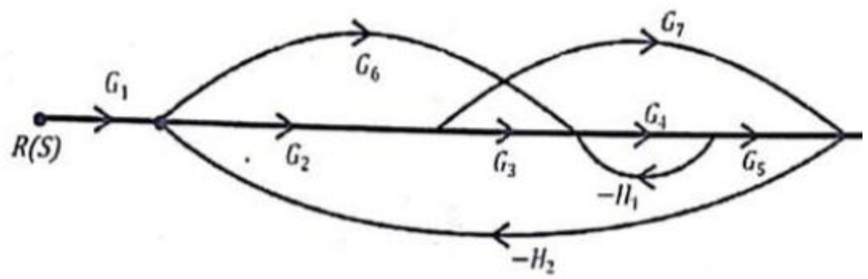
CONTROL SYSTEMS

UNIT I

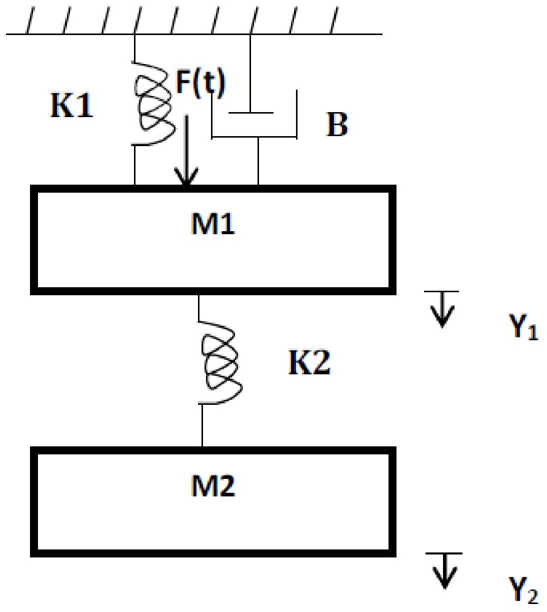
SYSTEMS COMPONENTS AND THEIR REPRESENTATION

Control System: Terminology and Basic Structure- Feed forward and Feedback control theory-Electricaland Mechanical Transfer function Models-Block diagram models-Signal flow graphs models-DC and ACservo Systems-Synchronous-Multivariable control system

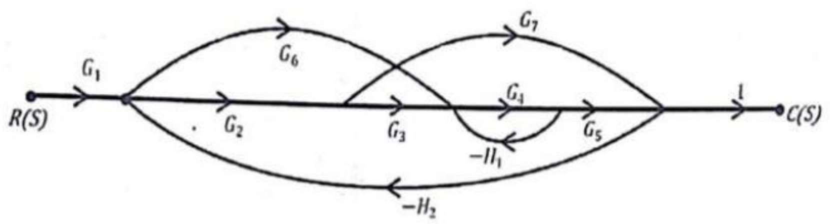
Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is called feedback control system? Give an example.	1	1	2
2.	Write the analogous electrical system in torque-voltage analogy for the elements of mechanical rotational system	1	2	2
3.	Define open loop and closed loop system.	1	1	2
4.	What are the basic elements used for modelling mechanical translational system?	1	1	2
5.	Draw the block diagram of a closed loop control system.	1	1	2
6.	What is the rule to shift the summing point before a block?	1	2	2
7.	State Mason's gain formula.	1	1	2
8.	Differentiate closed loop and open loop control system.	1	1	2
	PART B			
1.	Write the differential equations governing the electrical system as shown in figure and determine the transfer function $Eo(S)/Ei(S)$. Assume the capacitances C1 and C2 are not charged initially. 	1	2	16
2.	Using Mason's gain formula, obtain the transfer function of the given signal flow graph.	1	2	16



3.	Find the transfer function$\mathbf{2}(s)/f(s)$.	1	2	16



4.	Find the overall gain C(S)/R(S) for the signal flow graph shown in figure.	1	2	16



UNIT II

TIME RESPONSE ANALYSIS

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system-type number-PID control-Analytical design for PD,PI,PID control systems

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Draw the unit-step response curve for the second order system and show thetime domain specifications.	1	1	2
2.	What are generalized error coefficients?	1	1	2
3.	Distinguish between type and order of a system.	1	2	2
4.	What is the effect on system performance when a proportional controller is introduced in a system?	1	1	2
5.	Define settling time.	1	1	2
6.	Write the expression for a PID controller and its transfer function.	1	1	2
7.	Define steady state error.	1	2	2
8.	Define maximum peak overshoot.	1	1	2
	PART B			
1.	A unity feedback control system has an open loop transfer function $G(S) = 10/S(S+2)$. Determine its closed loop transfer function, damping ratioand natural frequency of oscillations. Also evaluate the rise time, peak overshoot, peak time and settling time for a step input of 12 units.	1	2	16
2.	State and explain the effects of P,PI and PID controllers on the system dynamics.	1	2	16
3.	Derive the expressions for second order system for under damped case and when the input is unit step.	1	2	16
		1	2	16
	Find the Static error coefficients for a system whose transfer			

	function is G(s)H(s)=10/s(1+s) (1+2s). And also find the steady state error for $r(t)=1+t+t^2/2$.			
4.	A unity feedback control system has an open loop transfer function $G(S) = 10/S(S+2)$. Determine its closed loop transfer function, damping ratioand natural frequency of oscillations. Also evaluate the rise time, peak overshoot, peak time and settling time for a step input of 12 units.	1	2	16

UNIT III

FREQUENCY RESPONSE AND SYSTEM ANALYSIS

Closed loop frequency response-Performance specification in frequency domain-Frequency responseof standard second order system-Bode plot-Polar plot-Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define phase and gain margin.	1	1	2
2.	What is the necessity of compensators?	1	1	2
3.	List out the different frequency domain specifications.	1	2	2
4.	Give the need for lag/lag-lead compensation.	1	1	2
5.	Define Bandwidth.	1	1	2
6.	What is the correlation between peak overshoot and resonant peak?	1	1	2
7.	Draw the position of pole zero of a lag compensator.	1	1	2
8.	What is meant by frequency response?	1	1	2
	PART B			
1.	Discuss the procedure for constructing the bode magnitude plot and bode phase plot.	1	2	16
2.	A unity feedback system has an open loop transfer function, G(s) =k/s (1+2s). Design a suitable lag compensator so that phase margin is 40^0 and the steady state error for ramp input	1	2	16

	is less than or equal to 0.2.			
3.	A Unity feedback control system has G(s) $=K/(S+4)(S+10)$. Draw the Bode plot.	1 1	2 2	8 8
	The open loop transfer function of a unity feedback system is G(s) $=KS(S+1)$.It is desired to have the velocity error constant $K_v= 12sec^{-1}$ and phase margin as 40^0. Design a lead compensator to meet the above specifications.	1	2	16
4.	Discuss the procedure for constructing the bode magnitude plot and bode phase plot.	1	2	16

UNIT IV

CONCEPTS OF STABILITY ANALYSIS

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What will be stability of the system when the roots of characteristic equation are lying on imaginary axis?	1	1	2
2.	What is Nyquist stability criterion?	1	1	2
3.	What are the necessary conditions for stability?	1	1	2
4.	What are the effects adding open loop poles and zero on the nature of root locus and on system?	1	2	2
5.	How stability of a system is defined based on the location of the roots of the characteristic equation?	1	1	2
6.	What are the advantages of Routh Hurwitz stability criterion?	1	2	2
7.	What is characteristic equation?	1	1	2
8.	Define BIBO stability.	1	1	2
	PART B			
1.	Draw the Nyquist plot for the system, whose open loop transfer function is G(s) H(s) $=K(1+0.5S)(1+S)$ /	1	2	16

	$(10S+1)(S-1)$. Determine the range of K for which closed loop system is stable.			
2.	Define stability. With an example, explain the steps to be followed for Routh-Hurwitz criterion.	1	2	16
3.	A unity feedback control system has an open loop transfer function(s) = $K(S+9)/S(S^2+4S+11)$. Sketch the root locus.	1	2	16
	Explain briefly about the steps to be followed to construct a root locus plot of a given transfer function.	1	2	16
4.	Draw the Nyquist plot for the system, whose open loop transfer function is G(s) H(s) $=K(1+0.5S)(1+S)$ / $(10S+1)(S-1)$. Determine the range of K for which closed loop system is stable.	1	2	16

UNIT V

CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback

Q.No	Question	CO	BTL	Marks
	PART A			
1.	How do you define State and State vector	1	1	2
2.	State sampling theorem.	1	1	2
3.	Define state model of nth order system.	1	1	2
4.	Write the homogeneous and nonhomogeneous state equation.	1	2	2
5.	List some advantages of sampled data control systems.	1	1	2

6.	Draw the block diagram representation of a state model.	1	1	2
7.	What is controllability?	1	1	2
8.	List the main properties of a state transition matrix.	1	1	2

PART B

1.	What are sampled data control systems? With an aid of a block diagram show basic elements of a sampled data control system and give functioning of these elements.	1	2	16
2.	Explain the concepts of controllability and observability.	1	2	16
3.	Obtain the complete solution of nonhomogeneous state equation using time domain method.	1	2	16
	Obtain a state space equation and output equation for the system defined by $\boldsymbol{Y(s)/U(s) = (S^3+S^2+S+2)/(S^3+4S^2+5S+2)}$	1	2	16
4.	What are sampled data control systems? With an aid of a block diagram show basic elements of a sampled data control system and give functioning of these elements.	1	2	16

*****END*****

EC3352

DIGITAL SYSTEMS DESIGN

UNIT I

BASIC CONCEPTS

Review of number systems-representation-conversions, Review of Boolean algebra-theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates ,Tabulation methods.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Convert the hexadecimal number A3F to its binary equivalent.	1	2	2
2.	Find the complement of F = wx+yz and then show that FF’ = 0.	1	2	2
3.	Implement the given function using NAND gates F=∑m (0, 6)	1	2	2
4.	Prove the Boolean theorems: (a) x + x = x (b) x + xy = x	1	2	2
5.	What are the universal gates? Why are they called so?	1	1	2
6.	Convert Y = A+BC’+AB+A’BC into canonical form.	1	2	2
7.	Map the SOP expression on the K-map (AB)’C+ A’BC’+A(BC)’+ABC.	1	2	2
8.	Prove that the logical sum of all minterms of a Boolean function of 2 variables is 1.	1	2	2
	PART B			
1.	State and prove De Morgan's theorems.	1	2	16
2.	Simplify the following Boolean expression using Boolean algebra: F (A, B, C) = A'B'C + AB'C' + AB'C + ABC'	1	3	16
3.	Simplify the following Boolean function using a Karnaugh map: F (A, B, C, D) = Σm(0, 2, 4, 5, 6, 7, 8, 10, 11, 13, 15)	1	3	16
4.	Implement the Boolean function F(A, B, C) = AB' + AC' using only NAND gates.	1	3	16

UNIT II

COMBINATIONAL LOGIC CIRCUITS

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Differentiate the Decoder and de-multiplexer.	2	2	2
2.	Design a three bit even parity generator.	2	2	2
3.	Write the logic expression of the difference and borrow of a half subtractor.	2	2	2
4.	Compare half-adder and a full-adder.	2	2	2
5.	Define multiplexer.	2	1	2
6.	Suggest a solution to overcome the limitation on the speed of an adder.	2	2	2
7.	What is priority Encoder?	2	1	2
8.	Design a single bit magnitude comparator to compare two words A and B.	2	2	2
	PART B			
1.	Explain the operation of a BCD Adder.	2	2	16
2.	Explain in detail about the Carry look ahead Adder.	2	2	16
3.	Discuss about magnitude comparator in detail.	2	2	16
4.	Design a 4 to 1 line encoder with input D1, D2, D3, D4 and decreasing order of priority from D3 to D0.	2	2	16

UNIT III

SYNCHRONOUS SEQUENTIAL CIRCUITS

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment,lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Differentiate Moore machine from Mealy machine.	3	2	2
2.	Write the characteristic equation of a T Flip flop.	3	1	2
3.	What is the race-around condition in a JK flip-flop?	3	1	2
4.	List the different types of shift registers.	3	1	2
5.	How can a SIPO register be used as a SISO register?	3	1	2
6.	Draw the state table and excitation table of T flip-flop.	3	1	2
7.	What is the classification of sequential circuits?	3	1	2
8.	Draw the NOR gate latch and write its truth table.	3	1	2
	PART B			
1.	Provide the characteristic table; characteristic equation and excitation table of D flip flop.	3	3	16
2.	Explain the operation of a JK master slave flip-flop.	3	2	16
3.	Implement T flip flop and JK flip flop using D flip flop.	3	3	16
4.	Design a 4-bit synchronous up/down counter using JK flip-flops. Draw the circuit diagram and timing diagram.	3	3	16

UNIT IV

ASYNCHRONOUS SEQUENTIAL CIRCUITS

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Differentiate between the fundamental mode and pulse mode asynchronous sequential circuits.	4	2	2
2.	What are hazards?	4	1	2
3.	Define critical race and Non critical race.	4	1	2
4.	What is a race-free state assignment?	4	1	2
5.	What is a dynamic hazard?	4	1	2
6.	What is the cause for essential hazards?	4	1	2
7.	What is the significance of State assignment?	4	1	2
8.	What is static 1 and 0 hazard?	4	1	2
	PART B			
1.	Explain race free assignments in detail with examples.	4	2	16
2.	Describe about Hazards in detail. How can you design Hazard free circuit? Explain with example.	4	3	16
3.	Design a asynchronous sequential circuit with two inputs T and C. The output attains a value of 1when T =1 and C moves from 1 to 0.otherwise the output is zero.	4	3	16
4.	Design a three bit binary counter using T flip flops.	4	3	16

UNIT V

LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES

Logic families- Propagation Delay, Fan - In and Fan - Out - Noise Margin - RTL ,TTL,ECL,CMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM,PROM,EPROM,EEPROM EAPROM.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the advantages of CMOS logic over TTL logic.	5	1	2
2.	Define fan-in and fan-out.	5	1	2
3.	Define noise margin.	5	1	2
4.	List the major differences between PLA and PAL	5	1	2
5.	Implement the Exclusive–OR function using ROM.	5	1	2
6.	Give the difference between RAM and ROM.	5	1	2
7.	What is access time and cycle time of a memory?	5	1	2
8.	Draw the CMOS inverter circuit.	5	1	2
	PART B			
1.	Discuss about ROM in detail.	5	2	16
2.	Describe about PROM in detail.	5	2	16
3.	Explain about Programmable Logic Array and Programmable Array Logic	5	2	16
4.	Implement a 3 bit up/down counter using PAL devices.	5	3	16

*****END*****