S3 CSE QUESTION BANK

COMPUTER SCIENCE & ENGINEERING

VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY TECHNICAL CAMPUS

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Index

Question Bank

THIRD SEMESTER

SUBJECT: MAT203 DISCRETE MATHEMATICAL STRUCTURES

Module 1			
Sl. No	**Questions**	**Marks**	**KU/KTU**
1	Construct truth table for (~p ∧ (~q ∧ r)) ∨ ((q ∧ r) ∨ (p ∧ r))	7	Dec 2017,
2	Check the validity of the argument. "lf horses or cows eat grass, then mosquito is the national bird. If mosquito is the national bird then peanut bufter tastes good on hot-dogs. But peanut butter tastes terrible on hot-dogs. Therefore, cows didn't eat grass."	3	DEC 2023
3	Using truth table prove[p →(q ∨ r) <=> ~r → (p →q)]	3	Dec 2022, Dec 2023
4	Determine the validity of the following statements using rule CP. "My father praises me only if I can be proud of myself. Either I do well in sports or I can't be proud of myself. If I study hard, then I can't do well in sports. Therefore if my father praises me then I do not study well"	8	Dec 2017 Dec 2023
5	Without using truth tables show that $(p \vee q) \wedge \neg(\neg p \wedge q) \Leftrightarrow p$	6	KTU DEC 2022
6	Show that S ∨ R is tautologically implied by (PVQ) ∧ (P→R) ∧ (Q→S)	8	Model Question
7	Write the symbolic form of the following statement and its negation. Also express the negation in words. "If cow is black then milk is white."	3	DEC 2023

8	Discuss indirect method of proof . Show that the following premises are inconsistent (i) If Jack misses many classes through illness, then he fails high school. (ii) If Jack fails high school, then he is uneducated. (iii) If Jack reads a lot of books, then he is not uneducated. (iv) Jack misses many classes through illness and reads a lot of books.	8	Model Question
9	Show that p∧ $(\sim p \wedge q)$ is a contradiction. Use Truth table	3	KTU DEC-2021
10	Show the following implication without constructing a truth table: (P∧ Q) $\Longrightarrow P \rightarrow Q$	3	KTU DEC-2021
11	Let P(x) and q(x) denote the open statements in the universe of all integers p(x) : $x^2 - 2x - 3 = 0$ & q(x): x < 0	3	KTU DEC 2022
	Module 2		
1.	Determine the number of six-digit integers (no leading zeros) in which (a) (i) no digit may be repeated (ii) digits may be repeated (iii) digits may be repeated and the six-digit integer is even (iv) no digit may be repeat and the six digit integer is divisible by 5 (b) In how many ways can the 26 letters of the alphabet be permuted so that none of the patterns car, dog, pun, or byte occurs?	7	KTU DEC 2023
2.	(a) A committee of 12 is to be selected from l0 men and l0 women. In how many ways can the selection be carried out if (i) there are no restrictions (ii) there must be six men and six women	3	KTU DEC 2023
3.	From a group of 7 men and 6 women, 5 people are to be selected to form a committee, such that at least 3 men are there in the committee. In how many ways can the committee be formed?	3	KTU DEC 2018
4.	Determine the number of positive integers n, 1<n<2000 that are not divisible by 2,3 or 5	6	KTU DEC 2023

5.	State Pigeon hole principle. Let .S be a set with positive integers and lSl = 32. How many elements of .S have the same remainder upon division by 36?	3	KTU DEC 2023
6.	In how many ways can the letters of the word 'SOCIOLOGICAL' be arranged such that all the vowels are together?	3	KTU DEC 2023
7.	Explain binomial theorem. Determine the coefficient of x9y3 in the expansion of $(x+y)^{12}$, $(x+2y)^{12}$ and $(2x- 3y)^{12}$ using binomial theorem.	6	Model question
8	In how many ways can we distribute eight identical white balls into 4 distinct containers so that (i)no container is left empty (ii)the 4^{th} container has an odd no. of balls in it?	8	KTU DEC-2021
9	Determine the coefficients of $x^9 y^3$ in the expansion of $(2x-3y)^{12}$	6	KTU DEC-2021
10	Find the number of permutations of 1,2,3,4,5,6,7 that are not derangements?	3	KTU DEC-2021
11	An auditorium has a seating capacity of 800.How may seats must be occupied to guarantee that atleast two people seated in the auditorium have the same first and last initials?(You may use pigeon hole principle)	7	KTU DEC-2021
12	In the expansion of $(x+y+z)^7$ determine the coefficient of (i) $x^2y^2z^2$ (ii) x^3y^4	6	KTU DEC 2022

Module 3

1	Let T be the set of all triangles in R2. Determine whether the relation R on T defined by, tr R tz if t1 and t2 have an angle of same measure, is reflexive, symmetric and transitive	3	KTU DEC 2023
2	Define a poset with an example	3	KTU DEC 2023
3	lf A = {1,2,3,4}, B = {5,6}, C={3,4,7}, determine (i)AU (B x C), (ii) (AU B) x C (iii)(AxC) U (BxC)	6	KTU DEC 2023
4	What is a chain lattice ? Explain. Also show that every chain is a distributive lattice.	7	Model question

5	Suppose f(x) = x+2 , g(x) = x-2, and h(x) = 3x for x ε R , where R is the set of real numbers. Find (g o f) , (f o g) , (f o f) and (g o g)	8	Model question
6	Let R and S be two relations on a set A . If R and S are symmetric, Prove that (R∩S) is also symmetric.	6	Model question
7	In a distributive lattice,show that aVb= aVc and aAb = a Ac together imply that b = c.	6	KTU DEC 2023
8	Draw the Hasse diagram for the following sets under the partial ordering relation "Divides", and indicates those which are totally ordered. {2,6,24}, {1,2,3,6,12}, {2,4,8,16}, {3,9,27,54}	7	KTU DEC 2017,2022
9	Prove that every equivalence relation on a set generates a unique partition of the set with the blocks as R-equivalence classes	7	KTU DEC 2018,2022
10.	Define a Distributive Lattice.Give an example with justification?	6	KTU DEC-2021
11.	Consider the set A={a,b,c}. Show that Q(A), the set of all proper subsets of A is a partially ordered set under the relation ⊆, the set inclusion. Draw the Hasse diagram for the poset (Q(A), ⊆). *Is it a lattice* ?	7	KTU DEC-2021
Module 4			
1	Solve an - 3an-1 + 2 ; a0 = 1 n ≥ 1, using generating functions.	8	Model Question
2	Use generating function to solve the following recurrence relation $a_n = 2a_{n-1} + 2n$; with $a_0 = 2$.	6	Model Question, DEC 2023
3	Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 0$ for $r \geq 2$; Given $a_0 = 0$; $a_1 = 41$ using generating functions	8	Model Question

4	What is meant by exponential generating function? Explain.	3	Model Question
5	Provide one example of linear homogeneous recurrence relation. Mention the degree also.	3	Model Question
6	Solve the recurraence relation $a_{n+2} + a_n = 0, n \geq 0, a_0 = 0, a_1 = 3$	8	KTU DEC-2021
7	Determine the sequence generated by the exponential generating function f(x)= $\frac{1}{1-x}$	6	KTU DEC-2021
8	Solve the recurrence relation a_{n+2}-10 a_{n+1}+21a_n=7(11)^n	8	KTU DEC-2021
9	Find the unique solution of the recurrence relation $2a_n - 3a_{n-1} = 0$; $n \geq 1$, a_4=81	6	KTU DEC-2021
10	A bank pays 6%o interest on savings, compounding the interest yearly. Write (3) the reccurence relation for this and solve it to find how much will a deposit of Rs 1000 be worth after l2years.	7	DEC 2023
11	Find the coefficient of x^7 in the expansion of (1+x+x^2+x^3+……)^{15}	3	KTU DEC-2021, DEC 2023
	Module 5		
1	Is the set of integers Z, a semigroup under subtraction? Justify your answ	3	DEC 2023
2	Show that the inverse of an element in a group is unique.	3	DEC 2023
3	a) Define a group with an example (b) Show that a cyclic monoid is abelian. _	8	DEC 2023
4	Show that the direct product of two group is a group.	6	MODEL QUESTION
5	Show that the subgroup of a cyclic group is cyclic.	8	MODEL QUESTION
6	Let (A,*) be a group. Show that (A,*) is an abelian group if and only if a^2* b^2=(a*b)^2 for all 'a' and 'b' in A	6	MODEL QUESTION, Dec 2022

7	Define (i)Semi group (ii)Monoid (iii)group. Give one example each ,different from one another .Is R the set of real numbers ,a group under multiplication ?Justify ?	8	KTU DEC-2021
8	If H and K are the subgroups of a group G ,Prove that H∩ K is $also$ a subgroup of G	6	KTU DEC-2021
9	Let (G,∘)and (H,*) be the groups with respective identities $e_G e_H$.If f: $G \to H$ is a homomorphism ,Prove that ,for all aϵG and $n \epsilon Z$ (i)f(e_G) = e_H. (ii)f(a^{-1})=[f(a)]$^{-1}$ (iii)f(a^n)=[f(a)]^n	8	KTU DEC-2021
10	Let G=(Z,+) be the group of integers under addition ,Let H ={…..,-8,-4,0,4,8…….}.Show that H is a subgroup of G .Write all the left cosets of H in G.	6	KTU DEC-2021
11	Let G ={1,-1,I,-i} and . defines multiplication (i) Show that (G,.) a group (ii) Is (G,.) a cyclic group If So, find each generator of G. (iii) Is (G,.) is a cyclic group .If so find each generator of G (iv) Find the order of each element in G	8	KTU DEC 2022

CST 201 DATA STRUCTURES			
MODULE 1			
Sl. No	**Questions**	**Marks**	**Year**

1.	Calculate the run-time efficiency of the following program segment using frequency count analysis.
	for (i = 1; i <= n; i++)
	for (j = 1; j <= n; j++)
	printf ("%d %d \n", i, j)
		3	**APR 2021**

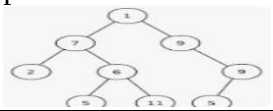
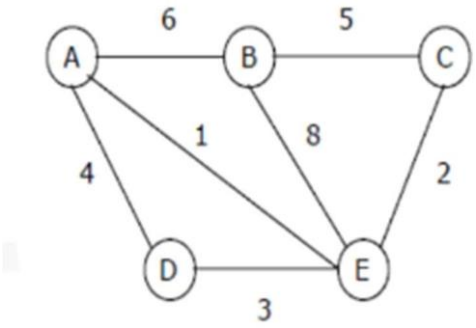
2.	What are the different criterions that an algorithm should satisfy?	**3**	**DEC 2021**
3.	Write an algorithm to find the number of occurrence of each element in an array and calculate the frequency count of the algorithm	**10**	**DEC 2021**
4.	Compare Top-Down approach with Bottom-Up approach	**4**	**DEC 2021**

5.	Calculate the frequency count of x=x+1 in the following code
	For(i=0;i<n;i++)
	For(j=0;j<n;j*=2)
	{
	X=x+1;
	}
		3	**Model Question**

6.	What is asymptotic notation? Describe about Big O notation.	**4**	**Apr 2021**
7.	Explain the System Life Cycle in detail	**3**	**Model Question**
8.	Derive the Big O notation for $f(n)=n^2+2n+5$	**3**	**APR 2021**
9.	Explain the best case, worst case, average case of linear search algorithm	**3**	**DEC 2022**
10.	Explain any three asymptotic notations used to express the complexity of algorithm with the help of suitable examples.	**3**	**DEC 2022**
MODULE 2			
1	Convert the expression ((A/B-D+E))*(F-G)*H) to postfix form, show each step in the conversion including the stack contents	**3**	**KTU Model**
2	What are the applications of stack?	**3**	**DEC 2023**

3	Given a matrix having 10 rows and 10 columns and 12 nonzero elements. How much space can be saved by representing the matrix in sparse (tuple) form?	**10**	**DEC 2021**
4	Write the algorithm to add two polynomials represented by arrays and illustrate with an example	**4**	**DEC 2023**
5	Write an algorithm to insert and delete element from Double Ended Queue? Demonstrate with Examples?	**10**	**KTU Model**
6	Compare and Contrast Normal Queue with Circular Queue.	**4**	**DEC 2023**
7	Write an algorithm to insert and delete elements from Priority Queue?	**8**	**KTU Model**
8	Write an algorithm to reverse a string using a stack.	**6**	**DEC 2023**
9	Find the postfix expressions of the following infix expression a) (A+B)*K+D/(E+F*G)+H b) ((A/D+B)*(K^Y))	**3**	**DEC 2021**
11	Write an algorithm to find the transpose of a matrix represented in tuple form	**6**	**DEC 2021**
12	Write an algorithm to convert an infix expression into its equivalent postfix expression. Convert the expression ((A/(B-D+E))*(F-G)*H) to postfix form. Show each step in the conversion including the stack contents.	**7**	**DEC 2023**
Module 3			
1	Write an algorithm to insert an element at the end of doubly linked list. Illustrate with the help of an example	**3**	**DEC 2023**
2	What do you mean by a circular linked list? Write an algorithm to perform insert and delete operations on a circular linked list.	**3**	**DEC 2023**

3	Given five memory partitions of 400Kb, 600Kb, 350Kb, 200Kb, 800Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 520 Kb, 617 Kb, 200 Kb, and 750 Kb (in order)?	**7**	**DEC 2023**
4	Write an algorithm to insert an element at the beginning, end and intermediate position of a doubly linked list	**7**	**DEC 2023**
5	Write an algorithm to append one linked list to another. Explain with an example.	**7**	**DEC 2023**
6	Write an algorithm for deleting a node from a specified position in a linked list	**4**	**KTU MODEL**
7	How is memory compaction (de-allocation) done in memory management?	**3**	**KTU MODEL**
8	Explain the Concept about Circular Linked List?	**3**	**DEC 2021**
9	Write procedures to push and pop elements from a Linked List Stack	**3**	**DEC 2022**
10	Write a function that deletes the last element of a singly linked list.	**4**	**KTU MODEL**
11	Write an algorithm /pseudocode to count the number of nodes in a singly linked list	**3**	**DEC 2022**
12	What are the advantages of linked list over arrays? Write algorithms to implement Queue using linked list	**3**	**DEC 2022**
MODULE 4			
1	Differentiate between complete binary tree and full binary tree with suitable example.	**3**	**DEC 2023**

2	Write and discuss algorithm to insert an element to Binary search tree. Show the structure of the binary search tree after adding each of the following values in that order: 2, 5, 1, 7, 10, 9, 11, 6.	**7**	**DEC 2023**
3	Write the non recursive preorder traversal algorithm	**7**	**DEC 2023**
4	What is the output obtained after preorder, inorder and postordertraversal of the following tree. 	**4**	**DEC 21**
5	Show the structure of the binary search tree after adding each of the following values in that order: 10, 1, 3, 5, 15, 12, 16. What is the height of the created binary search tree?	**4**	**DEC 21**
6	Write and illustrate Depth first search algorithm	**7**	**DEC 23**
7	Explain various graph representations with example	**7**	**DEC 23**
8	Write Breadth First Search algorithm and illustrate it on the below graph . 	**8**	**DEC 22**

9	How can we find the depth of a tree. Write an algorithm to find depth of a tree	**3**	**DEC 21**
MODULE 5			
1	Write an algorithm for merge sort technique. Illustrate with an example. Give its complexity	**9**	**DEC 23**
2	Write selection sort algorithm with the help of an example	**5**	**DEC 23**
3	Hash the following keys using open chaining method and closed linear probing method. Size of table is 11 and the Hash function H(K) = K mod 11. Keys ={17, 22, 34, 23, 19, 66}	**6**	**DEC 23**
4	With examples discuss the different hash functions used for hashing	**10**	**MODEL**
5	Apply the hash function h(x) = x mod 7 for linear probing on the data 2341, 4234, 2839, 430, 22, 397, 3920 and show the resulting hash table	**10**	**MODEL**
6	Explain with examples the different techniques for open addressing	**4**	**MODEL**
7	Explain any four hash functions with examples	**8**	**DEC 23**
8	Using the heap sort algorithm sort the input file [35 15 40 1 60]	**6**	**MODEL**
9	Give two different types of representation for graphs.	**4**	**DEC 21**
10	How Folding method can be used for Hashing	**4**	**DEC 21**
11	Write the insertion sort algorithm	**3**	**DEC 22**
12	Explain any two commonly used hash functions	**3**	**DEC 22**

CST 203 LOGIC SYSTEM DESIGN			
MODULE 1			
Sl No	**Questions**	**Marks**	**KTU YEAR**
1	Convert $(455)_{10}$ to base-4, 8 and 16.	3	KTU- Dec,2018
2	Subtract $(9F2C)_{16}$ from (A96B)16 using 15's and 16's complement method. b) Subtract 366 from 170 in BCD using 10's complement addition. (c) Perform (417)8 – (232)8 using 8's complement addition.	9	KTU- Dec,2018
3	Convert the decimal number 3.248 x 10 4 to IEEE 754 standard single precision	2	KTU- Dec,2018
4	i) Express each decimal number as an 8-bit number in the 2's complement form i) +101 ii) -125 ii) Given √(224)r =(13)r , then what is the value of r?	3	KTU -Sep.2020
5	i) If (73)x =(54)y ,then what are the possible values of x and y? ii) The 16-bit 2's complement representation of an integer is 1111 1111 1111 0101. What is its decimal representation?	3	KTU -Sep.2020
6	Write a) 1's complement And 2) 2's complement representations of (-126)	3	KTU -Dec.2020
7	Convert i) (13AF)16 to octal ii) (10110101.101)2 to decimal	6	KTU -Dec.2020
8	Add i) BCD numbers 1567 and 968 ii) octal numbers 2376 and 5677	8	KTU -Dec.2020

9	Perform the following operations using 2's complement representation i) (-34) + (+21) i) (+26) – (-12) ii) iii) (-33) + (-22) iv) (+45) – (+32)	10	KTU -Dec.2020
10	Do the following base conversions a) (96DE)16 to octal b) (1011011000)2 to octal		KTU -Dec.2021
11	Convert i) .(214)10 to binary, octal, BCD and hexadecimal ii) (128) to binary, octal, BCD and hexadecimal	8	KTU -Dec.2021
12	Add 127 and 765 assuming the numbers are i) octal ii) BCD iii) hexadecimal	6	KTU -Dec.2021
13	Perform the mentioned base conversions for the following numbers. (i) (563.8125)10 to binary (ii) (78.89)10 to octal (iii) (EC.4)16 to decimal	3	KTU -Dec.2022
14	The 2's complement representation of a binary number is 10101100. (i) Determine its decimal value. (ii) Represent it in 1's complement form	3	KTU -Dec.2022
15	a) i) Convert (10111101.11100110)2 to octal and hexadecimal bases. Perform the binary operations 1101 **x** 110 and 10111 **+** 1101 b) Convert the following decimal numbers to 8421 BCD and perform the operations. i) 528 + 374 ii) 528 - 374	7 7	KTU -Dec.2022
16	a) (i) Perform the binary subtraction 11011 – 1101 using 1's and 2's complements and verify results by direct subtraction. (ii) Perform the decimal subtraction 2210 – 3560 using 9's and 10's complements and verify results by direct subtraction b) Add (i) Hexadecimal numbers B2A and 5C7 (ii) Octal numbers 763 and 456	10 4	KTU -Dec.2022

MODULE 2

Sl No	Questions	Marks	KTU YEAR
1	Express the following functions as product of max-terms: a) F(X,Y,Z) = Y' +XZ' + XY'Z' b) b) F(A,B,C) = C (A+B') (A' +B' + C')	3	KTU- Dec.2018
2	Simplify F(A,B,C,D)=Σ(1,4,6,7,8,9,10,11,15) using Tabulation method and determine the prime implicants, essential prime implicants and the minimized Boolean expression	9	KTU- Dec.2018
3	Express the following functions: i) F1=AB+BD' in sum of Minterms form. ii) F2=AB+B'C in product of Maxterms form.	3	KTU -Sep.2020
4	Reduce the following expression using K-Map. AB'C+B'+BD'+ABD'+A'C	6	KTU -Sep.2020
5	Simplify the Boolean function F (w, x, y, z) = Σm(0, 5, 7, 8, 9, 10, 11, 14, 15) using Quine-McCluskey method.	9	KTU -Sep.2020
6	State and prove De Morgan's Theorem	3	KTU -Dec.2020
7	Design a circuit using NAND gates for implementing EXCLUSIVE-OR function	3	KTU -Dec.2020
8	a) Using K Map simplify the function F(w, x. y, z) = Σ (0,1,2,3,5,7,8,9,10,13,15) b) Express the above function in product of maxterms form.	14	KTU -Dec.2020
9	Using Huntington's postulates prove that a) x + x = x b) x + 1 = 1	3	KTU -Dec.2021
10	Define Boolean algebra. Give an example	6	KTU -Dec.2021
11	Show that any digital circuit can be implemented using universal gates	18	KTU -Dec.2021

12	a) Simplify the Boolean function F(a,b,c,d) = Σ (0,1,2,5,7,8,9,10,11,13,15) using K map b) Verify the answer using tabulation method.	14	KTU -Dec.2021
13	Prove that (x+y)=x using Boolean algebra postulates and rules.	3	KTU -Dec.2022
14	Find the number of possible unique Boolean functions which can be formed using n Boolean variables? Explain.	3	KTU -Dec.2022
15	a) The Exclusive-OR gate is represented by the Boolean algebra expression AB'+A′B. Using DeMorgan's theorem and other Boolean algebra rules/laws derive an expression for Exclusive-NOR gate b) Simplify the function f(A,B,C,D)=Σ(0,1,2,8,12,13,14) +d(3,5,10,15) with Karnaugh map. d(.) refers to don't care conditions. Implement the simplified function using NAND gates	5 9	KTU -Dec.2022
16	a) Simplify the following function and implement using NOR gates. Assume both normal and complement inputs are available. f(x,y,z)=Z(0,4,6) b) Express F(x,y,z)=(xy+z)(y+xz) in both canonical forms	6 8	KTU -Dec.2022

MODULE 3

Sl No	Questions	Marks	KTU YEAR
1	Implement f(A,B,C,D)= Σ(0,2,3,6,8,9,13,14) using 8 x 1 MUX .	4	KTU- Dec.2018
2	Implement F= A(B+CD) +B'C with NAND gates.	3	KTU- Apr.2018
3	Derive the simplified output functions of a full subtractor.	3	KTU- Apr.2018
4	What is the disadvantage of binary parallel adder? Explain how a look ahead adder speeds up the addition process. Clearly show the derivations of equations.	9	KTU -Sep 2020

5	Draw the logic diagram of a 2x1 multiplexer circuit	3	KTU -Dec 2020
6	Design a code converter for converting a BCD to excess-3 code	8	KTU -Dec 2020
7	Explain BCD adder using a block diagram	7	KTU –Dec. 2020
8	Design a 2 bit magnitude comparator.	7	KTU –Dec. 2020
9	Distinguish between decoder and demultiplexer	3	KTU –Dec. 2021
10	Explain parallel adder/subtractor circuit with a logic diagram	8	KTU –Dec. 2021
11	Design a carry look ahead adder circuit for four bit binary addition	6	KTU –Dec. 2021
12	Design a 4x2 encoder circuit	6	KTU –Dec. 2021
13	Design an even parity code generator using XOR gates for a 4-bit code.	3	KTU –Dec. 2022
14	Design an octal-to-binary encoder circuit using OR gates	3	KTU –Dec. 2022
15	a) How does look-ahead carry reduce the carry propagation time in a binary parallel adder? Derive the Boolean functions for the carry outputs at different stages of a 4-bit look-ahead carry generator b) Design a 4-bit BCD adder and draw the block diagram	7 7	KTU –Dec. 2022
16	a) Design a full adder circuit using a decoder and external gates b) Design a 3-bit Gray to binary code converter.	6 8	KTU –Dec. 2022

MODULE 4

Sl No	Questions	Marks	KTU YEAR
1	Design a BCD ripple counter. Also verify its operation by means of a timing diagram.	10	KTU- Dec.2018

2	Design a counter that has a repeated sequence of the following six states: 000, 001, 010, 100, 101, 110	6	KTU- Dec.2018
3	Design and implement a 4 bit binary synchronous down counter.	10	KTU-Sep 2020
4	Derive the characteristic equation of a D flip flop from its excitation table	3	KTU-Dec.2020
5	How is a sequential circuit different from a combinational circuit? Give an example for each circuit.	3	KTU-Dec.2020
6	Design a 2 bit synchronous counter.	7	KTU-Dec.2020
7	Draw the state diagram and logic diagram of a BCD ripple counter.	6	KTU-Dec.2020
8	Distinguish between T flip-flop and D flip-flop	3	KTU-Dec.2021
9	Explain race around problem. How can it be eliminated?	3	KTU-Dec.2021
10	Explain 3 bit binary asynchronous counter with a logic diagram and timing sequence	8	KTU-Dec.2021
11	Explain i) SR flip-flop ii) JK flip-flop iii) master-slave flip-flop with excitation table and characteristic equation	12	KTU-Dec.2021
12	Explain edge triggered flip-flop	2	KTU-Dec.2021
13	Specify the characteristics table and characteristic equation of RS flip-flop.	3	KTU-Dec.2022
14	Differentiate synchronous counters and asynchronous counters. Give examples	3	KTU-Dec.2022
15	a) With a circuit diagram, explain the working of master-slave JK flip-flop. b) Explain the working of 4-bit register with parallel load with the help of a diagram.	7 7	KTU-Dec.2022
16	a) Design a 4-bit binary asynchronous counter using JK flipflops. Give the state diagram and logic diagram. b) Design a synchronous BCD Counter. Give the excitation table and circuit diagram	8 6	KTU-Dec.2022

MODULE 5

Sl No	Questions	Marks	KTU YEAR
1	Design a serial adder using a full adder and shift registers	5	KTU- Dec.2018
2	Give the logical configuration of shift registers. With a block diagram, explain the use of shift registers for serial transfer of data	5	KTU- Dec.2018
3	Draw the logic diagram of a 4-bit Johnson counter and explain the working with a timing diagram	8	KTU- Apr.2018
4	Explain the working of 3-bit Universal Shift Register	8	KTU- Apr.2018
5	Give 2 applications of shift register	2	KTU- Apr.2018
6	Write notes on Read Only Memory (ROM) and give any 2 applications of ROM. Write notes on Random Access Memory.	10	KTU -Sep 2020
7	Distinguish between a ring counter and Johnson counter	3	KTU -Sep 2021
8	When do you implement a combinational circuit using ROM and when do implement a combinational circuit using PLA in preference to ROM	3	KTU -Sep 2021
9	Explain the working of a 3 bit bidirectional shift register with parallel load	7	KTU -Sep 2021
10	Explain the working of a 3 stage Johnson ring counter with a block diagram	7	KTU -Sep 2021
11	Illustrate the algorithm for addition and subtraction of two floating point numbers.	7	KTU -Sep 2021
12	Illustrate the algorithm for addition and subtraction two binary numbers in sign magnitude form.	7	KTU -Sep 2021
13	Design a 4-bit shift register using D flipflops	3	KTU -Dec 2022
14	Describe Read Only Memory with the help of a block diagram.	3	KTU -Dec 2022

15	a) Describe the working of Programmable Logic Array (PLA) with a block diagram. b) Illustrate the algorithm for addition of 2's-complement numbers. State why 2's complement representation is preferred for binary arithmetic operations	7 7	KTU -Dec 2022
16	a) Design 4 bit Johnson counter and show its timing sequence b) Explain the representation of floating point numbers. State the algorithm for floating point addition	8 6	KTU -Dec 2022

CST 205 OBJECT ORIENTED PROGRAMMING USING JAVA			
QUESTION BANK			
MODULE 1			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	What is Just-In-Time compiler	3	KTU-December 2021,2023
2	Why Java is said to be a secure programming language	3	KTU-December 2021
3	Explain Lexical issues in Java with example	6	KTU-December 2021
4	Differentiate between function oriented and object oriented software design approaches using a suitable example.	8	KTU-December 2021,2023
5	Construct a UML Class diagram for Online Movie Ticket Booking System. The various entities involved in the system are Admin, Registered User, Visitor / Guest User, Movie, Book Ticket, Make Payment	8	KTU-December 2021
6	Construct a UML Activity diagram for Food Ordering System, which shows the flows between the activity of Order, Delivery, Food ltem, Category, Payment.	6	KTU-December 2021
7	How is platform independence achieved in Java	3	KTU-December 2022
8	Explain how garbage collection is done in Java	3	KTU-December 2022
9	Why Java is said to be robust?	3	KTU-December 2023
10	Draw a UML activity diagram for an order processing system	6	KTU-December 2023
11	Explain any four object-oriented features of Java with suitable example	8	KTU-December 2023

12	Draw a UML class diagram which shows structure and attributes of an ATM with entities Bank ATM, Debit Card, Customer, Account, ATM Transaction.	6	KTU-December 2023

MODULE 2			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Why is the 'main' method in Java qualified as public, static, and void?	3	KTU-December 2021
2	Explain the use of static variables with the help of an example.	3	KTU-December 2022
3	Can the final modifier be used with an abstract class? Justify your answer	3	KTU-December 2022
4	Write a Java program by creating a 'student' class having the following data members: rollNumber, name, mathMarks, phyMarks, chemMarks and methods getRequiredDetails() - to get required input and displayAverage() - to calculate average marks and display it. In class 'Implement' create an object of the Student class and get the required details from the user and display the average marks of that student.	7	KTU-December 2022
5	Write a java program that illustrates how 'this' keyword can be used to resolve the ambiguity between formal parameters and instance variables.	7	KTU-December 2022
6	What is inheritance? Illustrate hierarchical inheritance using a sample program.	7	KTU-December 2022
7	List the properties of a constructor.	3	KTU-December 2023
8	Discuss the use of public, private and protected access specifiers.	3	KTU-December 2023
9	Create a class Person with attributes name, age, address and a method display() to display the details. Create a subclass Student with attributes ,roll no,markl,mark2and mark 3.override display() method and calculate the grade. create another subclass Faculty with attributes faculty_id, department, basic_pay and DA. Override display() method to calculate total salary as (basic_Pay+DA)+70% of (basic_pay+DA). Create instances of Student and Faculty and display the details	8	KTU-December 2023

10	Explain method overloading with an example.	6	KTU-December 2022,2023
11	Explain dynamic method dispatch with an example.	8	KTU-December 2023

12	Discuss the uses of the final keyword citing examples.	6	KTU-December 2023
	MODULE 3		
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Differentiate between the usage of keywords throw and throws	3	KTU-December 2022
2	Explain the significance of CLASSPATH environment variable in Java	3	KTU-December 2022
3	Write a program to read the first n characters in a file where n is given by the user. The characters read from the file have to be reversed and displayed on screen. Built in methods can be used in the program.	7	KTU-December 2022
4	Explain the role of access modifiers when packages are used in Java	7	KTU-December 2022
5	Create a user defined exception 'InvalidAgeException'. Write a Java program that takes age as a Command Line Argument. Raise the Exception 'InvalidAgeException' if age is less than 18.	7	KTU-December 2022
6	Explain the concept of Serialization and demonstrate how an object can be serialized with a sample program	7	KTU-December 2022
7	Distinguish between checked and unchecked exceptions.	3	KTU-December 2023
8	Explain any three character stream classes in Java.	3	KTU-December 2023
9	create a package reversepackage. Add a crass Reverse in it with a method reverse() to print the reverse of a string without using built-in methods. create a crass outside the package and use this method to reverse a string.	8	KTU-December 2023
10	Explain object stream serialization with sample code.	6	KTU-December 2023

11	How do you create user defined exceptions in Java? write a Java program to find the average of n numbers entered as command line arguments. Raise a user defined exception if the average exceeds 100.	8	KTU-December 2023
12	Explain the use of interfaces in Java.	6	KTU-December 2023

MODULE 4			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	List any three event sources and their corresponding event types and listeners (3) used	3	KTU-December 2022
2	Illustrate the creation of array list with the help of a sample program	3	KTU-December 2022
3	Illustrate the event handling mechanisms in Java using the Delegation Event Model with the help of a diagram	8	KTU-December 2022
4	Illustrate the usage of the following methods related to String with appropriate sample code (i) find() (ii)substring() (iii) replace()	6	KTU-December 2022
5	What is multithreading? Write a multithreaded Java program that demonstrates the working of wait() and notify() methods.	7	KTU-December 2022
6	Explain how Action Event class and Focus Event class is used with emphasis on the methods and constants provided by the given classes	7	KTU-December 2022
7	Explain the different methods of creating threads in Java.	3	KTU-December 2023
8	List any three event listeners and the corresponding source object.	3	KTU-December 2023
9	write a multithreaded Java program with two threads. one thread generates even numbers from I to 100 and another thread generates odd numbers from r to 100. Ensure that the threads do not interfere.	8	KTU-December 2023
10	Discuss the methods for String comparison with examples.	6	KTU-December 2023
11	Explain how event handling is done in Java	8	KTU-December 2023

12	How do you access the elements in an array list? Illustrate with an examples	6	KTU-December 2023

MODULE 5			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	How events are handled in java Swing	4	KTU-December 2021
2	Write a Java program using Swing to create a frame having three text fields, three labels and a button. The interface has to accept a number in the first text (10) field. While clicking the button, the second and third text fields have to display the previous number and next number respectively, of the accepted input number.	10	KTU-December 2021
3	Compare Swing API and AWT API.	3	KTU-December 2022
4	Write a Java program that uses two text fields and a button. The first text field accepts temperature in Celsius. When the 'Convert' button is called the second text field displays the temperature in Fahrenheit. Use appropriate . Swing components and event handling techniques. F= C*9 /5)+32	9	KTU-December 2022
5	Describe the two different ways to create frames using the Swing package with appropriate examples.	5	KTU-December 2022
6	Discuss the Model View Controller (MVC) Architecture using a diagram. Also list out advantages of writing programs based on MVC Architecture.	7	KTU-December 2022
7	Describe the features of Swing.	3	KTU-December 2023
8	Explain about the containers in Swing.	3	KTU-December 2023

9	Explain with sample code the steps in establishing JDBC connectivity.	8	KTU-December 2023
10	Describe the architecture of JDBC with a neat diagram	6	KTU-December 2022,2023
11	write a GUI program to perform arithmetic operations of two numbers.	8	KTU-December 2023
12	Discuss any three layout managers in Swing	6	KTU-December 2022,2023

EST 200 DESIGN AND ENGINEERING

MODULE 1			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	What are the basic vocabularies in engineering design?	3	KTU DEC 2021
2	How to identify the customer requirements of design?	3	KTU DEC 2021
3	What is the importance of systematic design.	3	KTU JUN 2023
4	Explain the three objectives in the design of a glass bottle for Ayurvedic medicine.	3	KTU JAN 2024
5	Describe any three constraints that can occur in the design process of a lunch box.	3	KTU JAN 2024
6	Find the customer requirements for designing a website for an educationalinstitution. Show how the design objectives were finalizedconsidering the design constraints. Sketch a layout of the website showingdropdown menus	14	KTU DEC 2021
7	Identify the objectives, functions and constraints for designing a water levelindicator. Illustrate the various stages of the design process. Provide suitable sketches.	14	KTU JAN 2024
8	Describe the concept of generating design alternatives and choosing a design through designing a coffee mug with the help of sketches	14	KTU DEC 2022
9	Find the customer requirements for designing a new wrist watch. Identify the design constraints. Explain, how were the design objectives finalized the design constraints? Use hand sketches	14	KTU JUN 2023
10	Discuss the design process of designing a handbag for women of the age group of l5 to 25 years. Use hand sketches to support your idea	14	KTU JAN 2024

11	Show the designing of a medicine box, to keep the medicines sorted for a month of 30 days, going through the various stages of the design process. Use hand sketches to illustrate the processes.	14	KTU MAY 2024
12	Explain the design process to finalize best alternative design, using the example of a carry bag, which can also be converted to a trolley. Use hand sketches to support your idea.	14	KTU MAY 2024
	MODULE 2		
1	Illustrate the design thinking process through designing a walking stick for elderly people.	14	KTU JULY 2021
2	Describe the importance of empathize phase in design thinking.	3	KTU JULY 2021
3	Describe the iterative process involved in design thinking approach.	3	KTU DEC 2021
4	What are factors to be considered in preparing technical reports to communicate a design efficiently?	3	KTU JUN 2023
5	Illustrate the design thinking approach for designing a wearable technology for a college student. Describe each stage of the process. Illustrate the solution using sketches.	14	KTU DEC 2021
6	Why prototyping is important in the design process	3	KTU JUN 2023
7	Explain life cycle design	3	KTU JUN 2023
8	Design a water bottle that can be opened with one hand. Illustrate the various stages involved in design thinking. Sketch the final design	14	KTU JAN 2023
9	Explain the role of divergent-convergent questioning in design thinking	3	KTU JUN 2023
10	What are factors to be considered in preparing technical reports to communicate a design efficiently	3	KTU JUN 2023

11	Design a parachute mechanism for the safe landing of an egg that is dropped from a height of 3 meters using an iterative design thinking process with the help of sketches	14	KTU JAN 2024
12	Show how divergent and convergent thinking processes will help to choose the best design from a list of possible solutions, considering handwash dispenser as a case study. Illustrate the solutions using hand sketches.	14	KTU MAY 2024
	MODULE 3		
1	Describe the use of value engineering in the design process.	3	KTU DEC 2020
2	Prepare a technical report for a newly designed website for online training of students with neat diagrams for presenting to a client.	14	KTU DEC 2021
3	A round glass of 600 mm diameter and 6mm thick is available .This is to be designed as a table supported at three points by a steel tube bent in a convenient way .The height of the table is to be 300 mm and the total length of the tube used should not exceed 1.8 m, The tube should not be out or joined .Design the bent tube for supporting the table	10	KTU- Sep,2020
4	What is visual communication in design	3	KTU JUN 2023
5	What are the different types of sketches used by designers to communicate their design? How will you graphically communicate the design of a creative coloring 'book with design detailing, material selection, scale drawings and dimension. Use hand sketches.	14	KTU JUN 2023
6	Why do designers use mathematical modeling in the design proccss? Show.an example of how mathematics and physics play a role in design.	14	KTU JUN 2023
7	Compare prototype of a car with its model	14	KTU DEC 2023
8	Explain the method of developing a mathematical model for a passenger lift.	14	KTU DEC 2023

9	Assume that you have completed the design of a new model ceiling fan and a prototype is needed for testing. Communicate your idea to the production department effectively to manufacture the prototype.	14	KTU DEC 2023
10	Develop a technical report for a newly designed website for online training of students with neat diagrams for presenting to a client	14	KTU JAN 2024
11	Graphically communicate the design of an electric steamer for cooking. Draw the detailed 2D drawings of the same with design detailing, material selection, . scale drawings and dimensions. Use only hand sketches.	14	KTU MAY 2024
12	Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing with the help of an example.	14	KTU MAY 2024

MODULE 4			
1	Design waste bins to be kept at bus stops for waste collection enabling source separation. The bin should be theft-resistant and protect the contents of the bin from external weather conditions. Design the bins with ergonomic consideration for waste collection workers. Sketch the design using hand drawings.	14	KTU DEC 2020
2	Distinguish between project-based learning and problem-based learning in design engineering.	3	KTU DEC 2021

3	Develop some design modification for sports utility bag, to improve its functionalities as well as product value. Sketch the design	14	KTU DEC 2021
4	Describe how aesthetics is important in design process	3	KTU JUN 2023
5	What is -mean by modular design? Apply the modular design concept to design a bicycle.	14	KTU JUN 2023
6	What is the importance of project-based learning and problem-based learning? Use project based learning method to design a modern city for year 2030.	14	KTU JUN 2023
7	Enumerate six features of a modular design	3	KTU DEC 2023
8	Explain the aesthetic, ergonomic and safety considerations incorporated in the design of a baby tricycle.	14	KTU DEC 2023
9	Apply value engineering to a pen, and design a light weight pen torch. Illustrate the solution using sketches	14	KTU JAN 2024
10	Describe how modular design approach can be applied in the design of a pen.	3	KTU MAY 2024
11	Demonstrate the design of a kids study table and then depict how the design changes when considering l) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in design	14	KTU MAY 2024
12	Show the development of a nature-inspired design for a fashionable umbrella based on a banana leaf. Use hand sketches to support yourarguments	14	KTU DEC 2022

MODULE 5			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Describe how to estimate the cost of a pen and list the various parts. Show howthe economics will influence the engineering designs. Use hand sketches to support your argument14	3	KTU DEC 2020
2	How do ethics play a decisive role in engineering design?	3	KTU DEC 2021
3	What are the factors to be considered for a sustainable design?	3	KTU DEC 2021
4	What are design rights, and how can an engineer put it into practice?	3	KTU DEC 2021
5	Design a door handle with a lock which is easy to use. Use Hand sketches and give rationalization for the various features in the design	3	KTU DEC 2022
6	Explain design ethics and why is it important.	3	KTU JAN 2023
7	Describe the importance of evaluating economic considerations in product development with an example	14	KTU JAN 2023
8	lllustrate the changes in design of a solar powered street light in terms of production, use, and sustainability with the help of sketches	14	KTU JAN 2023
9	Enumerate the features of a sustainable product		KTU DEC 2023
10	How do ethics play a decisive role in engineering design	3	KTU JAN 2024
11	Explain how the sustainability aspect can be applied in the design of a handbag	3	KTU MAY 2024
12	Examine the changes in the design of a water bottle with constraints of l) production methods 2) life span requirement 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the change in design.	14	KTU MAY 2024

MCN201-SUSTAINABLE ENGINEERING

MODULE1

Sl. No.	Questions	Marks	Month/Year
1	What is sustainability? What is the need for sustainability.	3	DEC 23/22
2	What are the measures of Sustainable development	7	DEC 23
3	Explain the concept of sustainable development	14	DEC23/ 22
4	Write notes on social, environmental and economic sustainability concepts	10	DEC 22
5	What are the challenges for sustainable development?	5	DEC 23/22
6	Technology may affect sustainability in positive and negative ways. Give one example each for both case	3	DEC 21
7	Illustrate the three pillar model of sustainability	10	DEC 21
8	Explain the nexus between technology and sustainable development	5	DEC 22/17
9	Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world	10	DEC 18,
10	Explain Clean Development Mechanism	5	DEC 17
11	Comment on the challenges for sustainable development in our country and suggest a way to overcome the same	5	DEC 18
12	Write a short note on Millennium Development Goals.	5	APR 18
	MODULE -II		
1	Write notes on global warming	8	DEC 23
2	Explain climate change its effect and control measures	6	DEC23
3	Explain the various causes of water pollution. and methods to reduce the same	14	DEC 23,21
4	What are the various sources of solid waste? Explain methods of solid waste management and zero waste concept	14	DEC 22
5	Explain carbon footprint and ways to reduce your carbon footprint	14	DEC 22

6	What are the causes of air pollution	3	DEC 22
7	What is greenhouse effect? .	3	DEC 22
8	Densely populated areas are suffering major issues in the field of solid waste and waste water management	10	DEC21
9	Write short note on the need of environmental sustainability? Also explain the concept of zero waste?	3	DEC21
10	Give an account of solid waste management in cities	10	DEC19
11	Write a note on any one environmental pollution problem and suggest a sustainable solution . .	5	DEC18
12	Explain the 3R concept in solid waste management?	10	DEC17
	MODULE-III		
1	Explain environment impact assessment	14	DEC23/21/18
2	Write notes on environmental management systems and standard	14	DEC 23
3	Write note on life cycle analysis	14	DEC 22
4	Explain industrial ecology and industrial symbiosis.	14	DEC 22
5	What are the benefits of implementing environmental management system	3	DEC 22
6	Explain the term circular economy.	3	DEC 22
7	Suppose you are required to do the Life Cycle Assessment of an Electric Vehicle. In the utilisation stage, the assessment must be made for the energy used to drive the vehicle. List any three possible impacts of the Electric Vehicle during the usage stage? Suggest a possible way to reduce the impact during utilisation of the vehicle?	3	DEC 21
8	Differentiate between conventional and non conventional energy sources. Which will you support? Why?	10	DEC 21
9	Describe bio-mimicry? Give two examples.	3	APR 18
10	Suggest some methods to create public awareness on environmental issues	5	DEC 17
	MODULE4		
1	Write a note on fuel cells.	7	DEC 23
2	Write a note on bio fuels	7	DEC 23

3	How geothermal-energy can be captured	14	DEC 22
4	Explain conventional and non conventional energy sources	14	DEC 22
5	Enumerate the impacts of biomass energy on the environment	10	DEC 17
6	Comment on the statement, "Almost all energy that man uses comes from the Sun".	10	APR 18
7	Write notes on: a. Land degradation due to water logging. b. Over exploitation of water.	5	DEC 17
8	How can energy be derived from oceans	5	DEC18
9	What are the requirements of a wind energy project?	3	DEC 21
10	Explain the working of a photovoltaic cell with a neat sketch? What are the steps involved in bio fuel production?	5	DEC 18
	MODULE 5		
1	Explain the basic concept of sustainable habitat	5	DEC 23
2	Explain the methods for increasing energy efficiency in buildings	9	DEC 23
3	Explain the concept of green engineering	5	DEC 22
4	Write notes on sustainable cities	5	DEC 22
5	What is meant by sustainable habit.	4	DEC 22
6	What are the harmful impacts of transportation sector on sustainability	9	DEC22
7	Discuss any three methods by which you can increase energy efficiency in buildings.	5	DEC 21
8	Comment on the sustainable measures taken towards green building. .	5	DEC21
9	Suggest suitable measures to make the conveyance energy efficiency in buildings.	14	DEC21
10	Explain the criteria for the material selection of sustainable buildings?	10	APR21
11	Discuss the elements related to sustainable urbanization	5	APR18
12	Discuss any three methods by which you can increase energy efficiency in buildings	5	APR 17