S3 CSE QUESTION BANK

COMPUTER SCIENCE & ENGINEERING

VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY

TECHNICAL CAMPUS KILIMANOOR

Index

Question Bank

THIRD SEMESTER

SUBJECT: MAT203 DISCRETE MATHEMATICAL STUCTURES

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Module I			
Sl. No	Questions	Marks	KU/KTU
1	Construct truth table for $(\sim p \wedge (\sim q \wedge r)) \vee ((q \wedge r) \vee (p \wedge r))$	7	Dec 2017
2	Prove the following implication $(x)(P(x) \vee Q(x)) ==> (x) P(x) \wedge (\exists x) Q(x)$	8	Dec 2017
3	Represent the following sentences in predicate logic using quantifiers (i)"x is the father of the mother of y" (ii) "Everybody loves a lover"	7	Dec 2017
4	Determine whether the conclusion C follows logically from the premises H_1: $\sim p \vee q$, H_2: $\sim(q \wedge \sim r)$, H_3: $\sim r$ C: $\sim p$	6	Dec 2017
5	Without using truth table prove p → (q → p) <=> ~p → (p → q)	6	Dec 2017
6	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
7	Show that r →s can be derived from the premises p →(q →s), ~r ∨ p , q	6	Dec 2017
8.	Show that S ∨ R is tautologically implied by (PVQ) ∧ (P→R) ∧ (Q→S)	8	Model Question
9.	Show that from	8	

	(ii) (x)(F(x) ∧ S(x)) → (y) (M(y) → W(y)). (iii)(y) (M(y) ∧¬W(y)) the conclusion (x)(F(x) →¬S(x))		Model Question
10	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
11.	Check the validity of the following argument: "If I get the job and work hard, then I will get promoted. If I get promoted , then I will be happy. Therefore ,either I will not get the job or I will not work hard.	6	KTU Dec 2019
12.	Using truth table determine whether the conclusion ꓱP follows logically from the premises P→Q and ꓱ(P ∧ Q).	6	KTU DEC-2018
13	Show that p∧ ($\sim p \wedge q$) is a contradiction. Use Truth table	3	KTU DEC-2021
14	Show the following implication without constructing a truth table: (P∧ Q) $\Longrightarrow P \rightarrow Q$	3	KTU DEC-2021
15	Prove the validity of the following argument: If Rochelle gets the supervisor's position and works hard, then she will get a pay raise. If she gets the pay raise, then she will buy a new car. She has not purchased a new car .Therefore either Rochelle did not get the Supervisor's position or she did not work hard.	7	KTU DEC-2021
16	Negate and simplify the statement :$\forall x[p(x) \rightarrow q(x)]$	6	KTU DEC-2021
Module II			

1.	Prove that in any group of six people, at least three must be mutual friends or at least three must be mutual strangers.	3	KTU Dec 2017
2.	What is the minimum number of students required in an English class to be sure that at least six will receive the same grade, if there are five possible grades?	3	KTU DEC 2017
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.	In how many ways can 12 balloons be distributed at a birthday party among 10 children if we ensure that every child gets atleast one balloon	3	KTU DEC 2019
5.	How many permutations can be made with the letters of the word MISSISSIPPI taken all together? How many of these will be vowels occupying the even places?	6	KTU DEC 2019
6.	State Pigeon hole principle. Show that among any 11 numbers there exist atleast 2 numbers with the same unit digit	6	KTU DEC 2019
7.	Explain binomial theorem. Determine the coefficient of x^9y^3 in the expansion of $(x+y)^{12}$, $(x+2y)^{12}$ and $(2x-3y)^{12}$ using binomial theorem.	6	Model question
8.	How many 5 digit numbers can be formed from the digits 1,2,3,4,5 using the digits without repetition ? (i) How many of them are even? (ii) How many are even and greater than 30,000?	8	Model question

9.	There are 8 guests in a party. Each guest brings a gift and receives another gift in return. No one is allowed to receive the gift they bought. How many ways are there to distribute the gifts?	6	Model question
10.	Six papers are set in an examination of which two are mathematical. Only one examination will be conducted in a day. In how many different orders ,can the papers be arranged so that (i) Two mathematical papers are consecutive? (ii) Two mathematical papers are not consecutive?	8	Model question
11.	How many possible arrangements are there for the letters in MASSASAUGA in which 4A' s are together?	3	Model question
12.	Find the number of integers between 1 and 1000 inclusive, which are not divisible by 5, 6 or 8	3	Model question
13	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 4th container has an odd no. of balls in it?	8	KTU DEC-2021
14	Determine the coefficients of $x^9 y^3$ in the expansion of $(2x-3y)^{12}$	6	KTU DEC-2021
15	Find the number of permutations of 1,2,3,4,5,6,7 that are not derangements?	3	KTU DEC-2021
16	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
	Module III		
1	Show that the divisibility relation ' / ' is a partial ordering on the set Z_+.	3	Model question

2	Consider the functions given by $f(x) = 2x+3$ and $g(x) = x^2$. Find $(g \circ f)$ and $(f \circ g)$	3	Model question
3	Let A = { 1,2,3,4,...11,12} and let R be the equivalence relation on A x A defined by (a,b) R (c,d) iff a+d = b+c. Prove that R is an equivalence relation and find the equivalence class of (2 ,5)	7	Model question
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 $x \in R$, where R is the set of real numbers. Find $(g \circ f)$, $(f \circ g)$, $(f \circ f)$ and $(g \circ g)$	8	Model question
6	Let R and S be two relations on a set A . If R and S are symmetric, Prove that $(R \cap S)$ is also symmetric.	6	Model question
7	Define GLB and LUB for a partially ordered set. Give an example	3	KTU DEC 2017
8	Let X ={ 2,3,6,12,24,36} and the relation be such that $x \leq y$ if x divides y . Give the relation and draw the Hasse diagram of $(X, \leq)$. Also find the maximal and minimal elements.	6	KTU DEC 2017
9	Let $(L, \leq)$ be a lattice and $a,b,c,d \in L$. Prove that if $a \leq c$ and $b \leq d$, then (i) $a \vee b \leq c \vee d$	6	KTU DEC 2017
10	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

11	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
12	Define a complemented lattice. Give an example	3	KTU DEC 2018
13.	The relation R on Z^+ is defined by aRb if a divides b.Check whether R is (i)reflexive (ii)symmetric(iii)transitive .Is R an equivalence relation?	8	KTU DEC-2021
14.	Let A={1,2,3}.Consider the relation R on A defined as R={(1,2),(2,1),(2,3)}.Is R symmetric ?,antisymmetric?	6	KTU DEC-2021
15.	Define a Distributive Lattice.Give an example with justification?	6	KTU DEC-2021
16.	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 IV			
1	Solve $a_n - 3a_{n-1} + 2$; $a_0 = 1$ $n \geq 1$, using generating functions.	8	Model Question
2	Use generating function to solve the following recurrence relation $a_n = 2a_{n-1} + 2^n$; with $a_0 = 2$.	6	Model Question
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	Solve the recurrence relation ar - 4ar-1 + 4ar-2 = (r+1)2 using generating function.	6	Model Question
5	What is meant by exponential generating function? Explain.	3	Model Question
6	Provide one example of linear homogeneous recurrence relation. Mention the degree also.	3	Model Question

7	Solve the recurrence relation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$	6	KTU DEC 2017
8	Solve the recurrence relation $T(k) - 7\,T(k-1) + 10\,T(k-2) = 6 + 8k$ with $T(0) = 1$ and $T(1) = 2$.	6	KTU DEC 2018
9	Solve the recurrence relation $a_r + a_{r-1} = 3r\,2^r$ using characteristic root method	6	KTU DEC 2019
10	Solve the recurrence relation $a_r + 5a_{r-1} + 6a_{r-2} = 42.4^r$ where $a_2=278$ and $a_3=962$.	6	KTU APRIL 2018
11	Solve the recurraence relation $a_{n+2} + a_n = 0, n \geq 0, a_0 = 0, a_1 = 3$	8	KTU DEC-2021
12	Determine the sequence generated by the exponential generating function $f(x)=\dfrac{1}{1-x}$	6	KTU DEC-2021
13	Solve the recurrence relation $a_{n+2}-10\,a_{n+1}+21a_n=7(11)^n$	8	KTU DEC-2021
14	Find the unique solution of the recurrence relation $2a_n - 3a_{n-1} = 0; n \geq 1, a_4=81$	6	KTU DEC-2021
15	Find the generating function for the sequence $1,1,1\ldots\ldots1,0,0,0\ldots\ldots$ Where the first $n+1$ terms are 1	3	KTU DEC-2021
16	Find the coefficient of x^7 in the expansion of $(1+x+x^2+x^3+\ldots\ldots)^{15}$	3	KTU DEC-2021
	Module 5		
1	What is a monoid ? Explain	3	MODEL QUESTION
2	Let $(A, .)$ be a group. Show that $(ab)_{-1} = b_{-1}a_{-1}$	3	MODEL QUESTION
3	Prove that the set 'Q' of rational numbers other than 1 forms an abelian group with respect to the operation ' * ' defined by $a * b = a+b -ab$.	8	MODEL QUESTION
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
7	Show that the set N of natural numbers is a semigroup under the operation x*y=max(x,y). Is it a monoid?	6	KTU DEC 2017
8	Show that for any commutative monoid <M,*>, the set of idempotent elements of M forms a submonoid.	6	KTU DEC 2017
9	Let G = {1, a, a^2, a^3 } (a^4 = 1) be a group and H = {1, a^2 } is a subgroup of G under multiplication. Find all cosets of H.	3	KTU DEC 2017
10	For a cyclic group of order n generated by an element a, show that n is the least positive integer for which a_n = e. (e is the identity element)	6	KTU DEC 2018
11	Show that the order of a subgroup of a finite group divides the order of the group	3	KTU DEC 2019
12	The necessary and sufficient condition that a non-empty subset H of a Group G be a subgroup is a € H, b € H ⇒ ab-1 € H	6	KTU DEC 2019
13	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
14	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
15	Let (G,∘)and (H,*) be the groups with respective identities $e_G e_H$.If f: $G \rightarrow H$ is a homomorphism ,Prove that ,for all aϵG and nϵZ (i)f(e_G) = e_H. (ii)f(a^{-1})=[f(a)]$^{-1}$ (iii)f(a^n)=[f(a)]^n	8	KTU DEC-2021
16	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

CST201	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.	The time complexity of binary search algorithm is O(log n) justify the statement.	3	**Apr 2021**
4.	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**
5.	Compare Top-Down approach with Bottom-Up approach	4	**Dec 2021**
6.	$N^2 + N = O(N^3)$ Justify your answer.	3	**Model Question**
7.	Write an algorithm for Insertion Sort and calculate the frequency count.	10	**DEC 2021**
8.	What is the significance of Verification in System Life Cycle	4	**Model Question**

9.	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**

10.	What is asymptotic notation? Describe about Big O notation.	4	**Apr 2021**
11.	Distinguish between worst-case, best-case and average-case running times of an algorithm.	3	**Model Question**
12.	Write an algorithm to insert a new element in a particular position in an array?	3	**Model Question**
13.	What is an algorithm? How is its complexity analysed?	3	**Apr 2021**

14.	Explain the System Life Cycle in detail	3	Model Question
15.	Derive the Big O notation for $f(n)=n^2+2n+5$	3	Apr 2021

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.	Write an algorithm for linear Search and Binary search and compare their complexities	10	KTU Model
3.	Between O(logn) and O(nlogn) which one is better?why?	4	KTU Model
4.	Write an algorithm to insert and delete element from Double Ended Queue? Demonstrate with Examples?	10	KTU Model
5.	Compare and Contrast Normal Queue with Circular Queue.	4	KTU Model
6.	Write an algorithm to insert and delete elements from Priority Queue?	8	KTU Model
7.	Write an algorithm to convert infix to prefix expression?	6	Model Question
8.	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
9.	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?	3	DEC 2021
10.	Discuss an algorithm to convert an infix to postfix	8	DEC 2021
11.	Write an algorithm to find the transpose of a matrix represented in tuple form	6	DEC 2021
12.	Write algorithms to insert and delete elements from a circular Queue	6	DEC 2021
13.	Write an algorithm to add two polynomials represented using arrays.	8	DEC 2021

Module 3			
1.	Explain memory allocation for fixed sized blocks with the help of an algorithm	9	DEC 2021
2.	Explain Worst-fit allocation with an example	3	KTU Model
3.	Write algorithms to multiply two polynomials represented using linked list	3	Dec 2021
4.	Free memory blocks of size 60K, 25K, 12K, 20K, 35K, 45K and 40K are available in this order. Show the memoryallocation for a sequence of job requests of size 22K, 10K,42K, and 31K (in this order) in First Fit, Best Fit and Worst Fit allocation strategies.	3	Dec 2021
5.	Write algorithms to insert elements and delete elements from the beginning of Circular Double Linked List	3	Dec 2021
6.	Write an algorithm for deleting a node from a specifiedposition in a linked list	4	Model Question
7.	How is memory compaction (de-allocation) done in memory management ?	3	KTU Model
8.	How will you check the validity of an arithmetic expression using stack.	3	Dec 2021
9.	Write a C Program/algorithm to implement Linked list	7	Dec 2021
10.	Explain the Concept about Circular Linked List?	3	Dec 2021
11.	Write a function that deletes the last element of a singlylinked list.	4	Model Question
12.	Concatenate two circular double linked lists A and B sothat B appears after A.	4	Model Question
13.	Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit and best-fit algorithms place processes of 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order)? Which algorithm makes the most efficient use of memory?	4	KTU Model

		MODULE 4		
1	Write a recursive algorithm to perform preorder traversal.	3	**Dec 2021**
2	List the properties of binary search tree. Write an algorithm to search an element from a binary search tree.	9	**Dec 2021**
3	Write the non recursive preorder traversal algorithm.	4	**Dec 2021**
4	What is the output obtained after preorder, inorder and postorder traversal of the following tree.	3	**Model Question**
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 createdbinary search tree?	4	**DEC 2021**
6.	Develop an algorithm to add an element into a binary search tree.	4	**Dec 2021**
7.	Write an iterative algorithm for in-order traversal of a Binary Tree	3	**Dec 2021**
8.	Write a recursive algorithm to perform preorder traversal.	3	**Model Question**
9.	List the properties of Binary Search Tree. Write an algorithm to search an element from a Binary Search Tree	4	**Model Question**
10.	Give algorithms for DFS and BFS of a graph and explain with examples	8	Dec 2021

11.	What is the output obtained after preorder, inorder and postorder traversal of the following tree.		DEC 2021
12	With the help of an example, explain how a binary tree can be represented using an array.	3	Dec 2021
13	Write an algorithm to delete a node from a Binary Search Tree?	4	Dec 2021
14.	Explain the term Complete Graph with an example	4	Dec 2021
15.	How graphs can be represented in a Computer?	6	KTU MODEL
16	How can we find the depth of a tree. Write an algorithm to find depth of a tree	3	Dec 2021
Module 5			
1.	Write an algorithm for merge sort technique. Illustrate with an example. Give its complexity.	10	DEC 21
2.	Write algorithms for Merge sort and Quick Sort.	10	KTU MODEL
3.	Illustrate the working of Quick sort on the following input 38, 8, 0, 28, 45, -12, 89, 66, 42	4	KTU MODEL
4.	With examples discuss the different hash functions used for hashing	10	KTU 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	KTU MODEL
6.	Explain with examples the different techniques for open addressing	4	Model Question
7.	Give the heap sort algorithm. Write the complexity of your algorithm.	4	Dec 2021

8.	Using the heap sort algorithm sort the input file [35 15 40 1 60].	6	KTU MODEL
9.	Give two different types of representation for graphs.	4	Dec 2021
10.	How Folding method can be used for Hashing	4	Dec 2021
11.	Using the selection sort algorithm, sort the input file [25, 7, 46, 11, 85].	6	Dec 2021

CST 203 – LOGIC SYSTEM DESIGN

Sl.No.	Questions	Marks	KTU, Year
MODULE 1			
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	8	KTU -Dec.2021

	ii) ii) (128) to binary, octal, BCD and hexadecimal		
12	Add 127 and 765 assuming the numbers are i) octal ii) BCD iii) hexadecimal	6	KTU -Dec.2021

MODULE 2

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	8	KTU -Dec.2021
11	Show that any digital circuit can be implemented using universal gates	6	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

MODULE 3

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	8	KTU –Dec. 2020

	code		
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
MODULE 4			
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
MODULE 5			
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	3	KTU -Sep 2021

	ROM and when do implement a combinational circuit using PLA in preference to ROM.		
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

CST205	Object Oriented Programming Using Java

Module I

Sl. No	Questions	Marks	Year
1	Consider a Banking System. Identify three entities in the system which can be represented using classes and show the relationship between them using UML class diagrams	3	May 2019
2	Draw Use case Diagram for online Pizza ordering system	6	May 2019
3	Discuss the concept of classes and objects in Java language using an example of a 'student' object in a Student management application	3	Dec 2020
4	What are the advantages of using UML? Sketch the UML class diagram for an entity 'book'	3	Dec 2020
5	Describe buzzwords of Java that defines the Java programming language	10	Dec 2020
6	Comapre and contrast Java Applets and Java Application	4	Dec 2020
7	Illustrate the Java Programming and Runtime Environment. Explain the roles of each component of it while compiling and executing a java program.	10	Dec 2020
8	Explain about Lexical issues in java with example	6	Dec 2021
9	What is Just-In-Time compiler	3	Dec 2021
10	Why Java is said to be secure programming language	3	Dec 2021
11	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	Dec 2021
12	Differentiate between function oriented and object oriented software design approaches using suitable example	8	Dec 2021

Module II				
1	Differentiate between Arrays and Vector class in Java	3	Dec 2020	
2	List out any three literal types in Java .Give examples for each	3	Dec 2020	
3	Discuss about bitwise, relational and conditional operators in Java with examples and compare its precedence'	6	Dec 2020	
4	Demonstrate the role of 'super' keyword in the context of inheritance in Java with appropriate examples	8	Dec 2020	
5	Point out the significance of 'this' keyword with an example	4	Dec 2020	
6	Write a java program to show the significance of method overriding in achieving run time polymorphism. Discuss difference between method overriding and method overloading	10	Dec 2020	
7	Does Java support multiple inheritance? Justify your answer	3	Dec 2021	
8	Why is the 'main' method in Java qualified as public, static, and void?	3	Dec 2021	
9	Write a Java program to reverse bits of a given integer	6	Dec 2021	
10	Demonstrate how objects are passed as function parameters with a suitable example	8	Dec 2021	
11	Write a Java program to find the frequency count the occurrence of each element in an integer array	6	Dec 2021	
12	Explain different data types in Java. Give example	8	Dec 2021	

	Module III		
1	What are Checked Exceptions? Give an example.	3	May 2019
2	How do you create and import a package in Java	3	Dec 2020
3	Write an example of implementing an interface in Java	3	Dec 2020
4	Write a Javaprogram to copy the contents of one file to another file using Fi lelnputStream and F ileOutputStream classes	5	Dec 2020
5	Describe various methods of reading data from the keyword with appropriate examples in Java	9	Dec 2020
6	Differentiate between checked and unchecked exceptions in Java with examples.	4	Dec 2020
7	b) Demonstrate the significance of the keywords 'try', 'catch','finally','throw' and 'throws' in exception handling of Java with appropriate examples	10	Dec 2020
8	Develop a Javapackage named 'evenpackage', with a class Even containing a static method that check whether a number is even or not. and returns that information. Import, this package in another class and use to check a number is even or not.	8	Dec 2021
9	Write a Java program that reads a binary file and write to another file	8	Dec 2021
10	Write Java code that reads a character file and prints the contents of file on the display, with a line number before each line	6	Dec 2021
11	Explain any three Byte Stream classes in Java	3	Dec 2021
12	What are Checked Exceptions? Give an example	3	Dec 2021

			Module IV			
	1	Illustrate the working of any two methods of String class that compare strings.	3	Dec 2020
	2	List and explain any three methods defined by the 'List' interface in Java	3	Dec 2020
	3	a) Discuss the event handling mechanism in Java using the Delegation Event Model?	8	Dec 2020
	4	How mouse events are handled in Java? Give suitable Java source code	6	Dec 2020
	5	Discuss the methods of creating threads in Java using appropriate examples	8	Dec 2020
	6	Write a Java program that creates multiple child threads to print odd and even numbers from 50-100	6	Dec 2020
	7	List any six Event Listener interfaces.	3	Dec 2021
	8	Explain any three special string operations in Java		Dec 2021
	9	Write a Java program to find the duplicate character in a string. .	8	Dec 2021
	10	What are the uses of synchronized keyword in Java? Explain with examples.	6	Dec 2021
	11	Write a Java program that creates three threads. First thread generates a random positive number (>l) every I second. If the number is even, the second thread prints all even numbers between I and the generated number. If the number is odd, the third thread will print all odd numbers between 1 and the generated number.	10	Dec 2021
	12	Differentiate between Collection Interface and Collections Class	4	Dec 2021
			Module V		
	1	What is meant by dynamic query?	3	May 2019
	2	Point out the use of a Swing Layout Manager. Explain any one type.	3	Dec 2020
	3	Compare any three types of Swing button classes .	3	Dec 2020
	4	what is use of Swing package in java? Discuss any two features	6	Dec 2020

5	write a program to illustrate the use of JFrame, JTextField and JLabel	8	Dec 2020
6	write sample code to establish database connectivity in Java. Discuss the various steps involved.	10	Dec 2020
7	Write Java code to demonstrate the execution of create and insert queries using JDBC	4	Dec 2020
8	Summarize any three features of Swing API.	3	Dec 2021
9	Differentiate between Components and Containers in Swing	3	Dec 2021
10	Write java code to demonstrate the execution of select and delete queries using JDBC	7	Dec 2021
11	How events are handled in java Swing?	4	Dec 2021
12	Write a Java program using Swing to create a frame having three text fields, threelabels and a button. The interface has to accept a number in the first text field. While clicking the button, the second and third textfields have to display the previous number and next number respectively, of the accepted input number	10	Dec 2021

Course Code: MCN201

Course Name: Sustainable Engineering

	Module I		
SL. No	Questions	Marks	Year
1.	Define sustainable development.	5	April 2018
2.	Write a short note on Millennium Development Goals.	10	April 2018
3.	Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world.	10	Dec2018
4.	Explain Clean Development Mechanism	5	Dec2017
5.	Explain with an example a technology that has contributed positively to sustainable development.	5	Dec2017
6.	Illustrate the nexus between agricultural technology and sustainability.	5	Dec 2017
7.	Comment on the challenges for sustainable development in our country and suggest a way to overcome the same	5	Dec 2018
8.	Technology may affect sustainability in positive and negative ways. Give one example each for both cases	3	Dec2021
9	Write a short note on need of sustainability	7	Dec2021
10	Illustrate the three pillar model of sustainability.	10	Dec2021

	Module II		
SL. No	Questions	Marks	Year
1.	Describe carbon credit.	5	April 2018
2.	Give an account of climate change and its effect on environment.	5	April 2018
3.	Explain the common sources of water pollution and its harmful effects.	5	April 2018
4.	Give an account of solid waste management in cities	10	Dec 2019

5.	Explain the 3R concept in solid waste management?	10	Dec 2017
6.	Write a note on any one environmental pollution problem and suggest a sustainable solution.	5	Dec 2018
7.	In the absence of green house effect the surface temperature of earth would not have been suitable for survival of life on earth. Comment on this statement.	10	Dec 2018
8.	Write short note on the need of environmental sustainability? Also explain the concept of zero waste?	3	Dec 2021
9	Discuss water pollution and the source, cause and effect of same.	7	Dec 2021
10	Densely populated areas are suffering major issues in the field of solid waste and waste water management.	10	Dec 2021

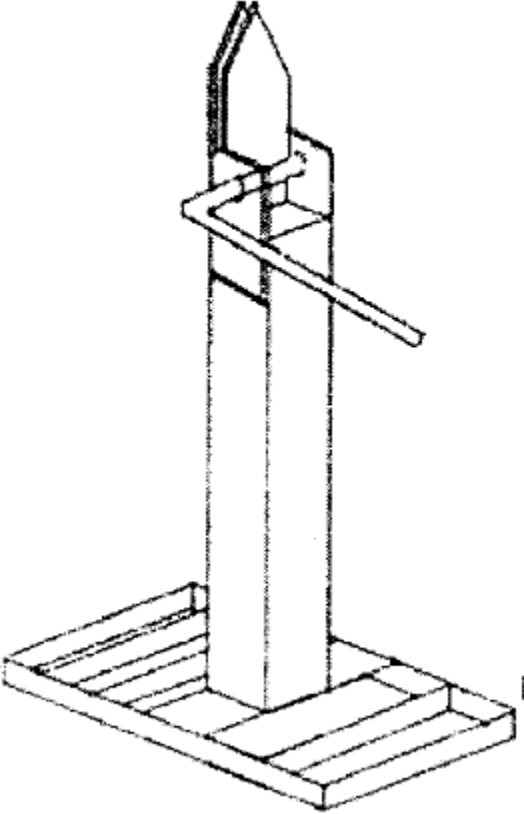| Module III			
SL. No	**Questions**	**Marks**	**Year**
1.	Describe biomimicry? Give two examples.	5	April 2018
2.	Explain the basic concept of Life Cycle Assessment.	10	April 2018
3.	Explain the different steps involved in the conduct of Environmental Impact Assessment	5	April 2018
4.	Suggest some methods to create public awareness on environmental issues.	5	Dec 2017
5.	"Nature is the most successful designer and the most brilliant engineer that has ever evolved". Discuss.	10	Dec 2017
6.	Match the items in the following sets: SetA: {ISO 14006; ISO 14041; ISO 14048;ISO 14012} Set B: {LCA Data Documentation Format; Environmental Auditing qualifying criteria; Eco design guidelines; LCA inventory analysis}	10	Dec 2017
7.	Write short notes on ISO 14000 series	5	Dec 2021
8.	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 2021
9	Differentiate between conventional and non conventional energy sources. Which will you support? Why?	10	Dec 2021
10	Explain resources and its utilization	3	Dec 2021

11	Describe Environment Impact Assessment (EIA)	5	Dec 2021

Module IV			
SL. No	Questions	Marks	Year
1.	Name three renewable energy sources.	5	April 2018
2.	Mention some of the disadvantages of wind energy.	5	April 2018
3.	Comment on the statement, "Almost all energy that man uses comes from the Sun".	10	April 2018
4.	Write notes on: a.Land degradation due to water logging. b. Over exploitation of water.	5	Dec 2017
5.	Enumerate the impacts of biomass energy on the environment	10	Dec 2017
6	Explain the working of a photovoltaic cell with a neat sketch? What are the steps involved in bio fuel production?	5	Dec 2018
7	How can energy be derived from oceans?	5	Dec 2018
8.	Explain in detail any one methodgy to extract geothermal energy	3	Dec 2021
9	What are the requirements of a wind energy project?	3	Dec 2021
10	Outline the concepts related to conventional and non-conventional energy residential building in tropical climate.	14	Dec 2021
11	Write a note on advantages of non-conventional energy sources	3	Dec 2021

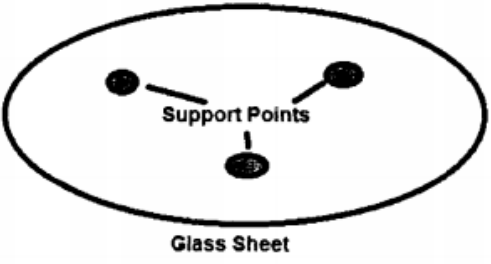| Module V			
SL. No	Questions	Marks	Year
1.	Enlist some of the features of sustainable habitat	5	April 2018
2.	Explain green engineering.	5	April 2018
3.	Discuss the elements related to sustainable urbanisation.	5	April 2018
4.	Discuss any three methods by which you can increase energy efficiency in buildings	5	April 2017
5.	How a green building differs from a conventional building? Compare any five aspects?	5	April 2019
6.	Explain the criteria for the material selection of sustainable builings?	10	April 2021

7	Suggest suitable measures to make the conveyance energy efficiency in buildings.	14	Dec 2021
8	Comment on the sustainable measures taken towards green building.	3	Dec 2021
9	Discuss any three methods by which you can increase energy efficiency in buildings.	5	Dec 2021

EST 200 DESIGN AND ENGINEERING

	MODULE 1		
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Discuss the importance of design constraints?	3	KTU DEC 2020
2	Describe how to select the "best possible design" from the generated design alternatives.	3	KTU DEC 2020
3	List the constraints and objectives of designing a lunch box for the school students	5	KTU- May,2019
4	Design a length adjustable mop to clean ceiling fan	5	KTU- May,2019
5	what are the objectives and constraints of above design	5	KTU- May,2019
6	Prepare the objective tree for the product coconut peeling machine given below	5	KTU- May,2019
7	Give the main objectives and constraints for the design a)Main entrance door of a house b)The door of a room		

	with in the house c)The door to a bathroom within the house		
8	What are the basic vocabularies in engineering design?	3	KTU DEC 2021
9	How to identify the customer requirements of design?	3	KTU DEC 2021
10	Find the customer requirements for designing a website for an educational institution. Show how the design objectives were finalized considering the design constraints. Sketch a layout of the website showing dropdown menus.	14	KTU DEC 2021
11	Show the designing of an iron box going through the various stages of the design process. Use hand sketches to illustrate the processes.	14	KTU DEC 2021
12	Design two alternatives of a chair suitable for a five-year-old child, and then to narrow down to the best design based on objectives and constraints. Sketch both the designs	14	KTU DEC 2020
13	Identify the objectives, functions and constraints for designing a water level indicator. Illustrate the various stages of the design process.Provide suitable sketches.	14	KTU DEC 2020
MODULE 2			
1	Discuss how to manage the conflicts in a team executing the design thinking process.	3	KTU DEC 2020
2	How does the design thinking approach help engineers in creating innovative and efficient designs?.	3	KTU DEC 2020
3	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 DEC 2020
4	During the Covid-19 pandemic, people have to wear a mask, but wearing a mask is not comfortable. Empathize about this design problem and arrive at a solution using the design thinking process, so that people can select the level of protection provided by masks according to different situations. Illustrate the solution using sketches	14	KTU DEC 2020
5	Design a manual mango plucker (with height adjusting mechanism)which can be used by a common man to pluck and collect safely the mangoes from the mango tree n his	10	KTU- july,2018

	yard. • Prepare a detailed design highlighting the benefits of our design • Draw a neatly labeled sketches showing your design		
6	Describe the iterative process involved in design thinking approach.	3	KTU DEC 2021
7	Describe the importance of empathize phase in design thinking	3	KTU DEC 2021
8	Some of the vehicle drivers do not dim the headlights when facing another vehicle at night. Empathize about this design problem and arrive at a solution using the design thinking process. Illustrate the solution using sketches.	14	KTU DEC 2021
9	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
MODULE 3			
1	Describe the use of value engineering in the design process.	3	KTU DEC 2020
2	Explain the role of mathematics and physics in design engineering process.	3	KTU DEC 2020
3	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
4	Design a foldable steel table. Draw the detailed 2D drawings of the same with design detailing, scale drawings and dimensions. Use only hand sketches	14	KTU DEC 2021
5	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 legth of the tube used should not exceed 1.8 m,The tubeshould not be out or joined .Design the bent tube for supporting the table	10	KTU- Sep,2020

Support Points

Glass Sheet

6	How can a design be communicated through engineering sketches and drawings?	3	KTU DEC 2021
7	Design an integrated water bottle with lunch box. Draw the detailed 2D drawings of the same with design detailing, material selection and dimensions. Use only hand sketches.	14	KTU DEC 2021
8	Prepare a technical report for a newly designed portable ladder with neat sketches for presenting to a client	14	KTU DEC 2021
MODULE 4			
1	What is meant by modular design?	5	KTU- May,2019
2	Apply the modular design concept for a product bicycle	5	KTU- May,2019
3	How modular design is realized in i) Umbrella and ii) Ink Pen ? Draw the different modules involved in each of these products.	4	KTU- May,2019
4	Apply the principles of value engineering,design a school bag for the students residing in poor home. Neatly sketch the design and prepare a descrption for the same	5	KTU- July,2018
5	Show the development of a nature inspired design for a solar powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches	3	KTU DEC 2020
6	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
7	Distinguish between project-based learning and problem-based learning in design engineering.	3	KTU DEC 2021
8	Apply value engineering to a pen, and design a	14	KTU DEC 2020

	lightweight pen torch. Illustrate the solution using sketches.		
9	Considering the principle of value engineering. Design a suitable product for easy cleaning of dust from windows,fans and lamp shades.	5	KTU- june ,2017
10	Draw the figure of a smart phone which is both aesthetic and ergonomic	5	KTU- june ,2017
	Show the development of a nature-inspired design for a fashionable umbrella based on a banana leaf. Use hand sketches to support your arguments	14	KTU DEC 2021
11	Develop some design modification for sports utility bag, to improve its functionalities as well as product value. Sketch the design	14	KTU DEC 2021
MODULE 5			
1	Describe how to estimate the cost of a pen and list the various parts. Show how the economics will influence the engineering designs. Use hand sketches to support your arguments	14	KTU DEC 2020
2	Design a fan which automatically reduces speed or stops when the temperature reduces during the night for energy conservation. Use hand sketches to support your design	14	KTU DEC 2020
3	How do ethics play a decisive role in engineering design?	3	KTU DEC 2020
4	How to estimate the cost of a particular design?.	3	KTU DEC 2020
5	What are the factors to be considered for a sustainable design?	3	KTU DEC 2021
6	What are design rights, and how can an engineer put it into practice?	3	KTU DEC 2021
7	Design a sustainable piping network for reuse of water in a residential building enabling water conservation. Sketch the design.	14	KTU DEC 2021
8	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	14	KTU DEC 2021