

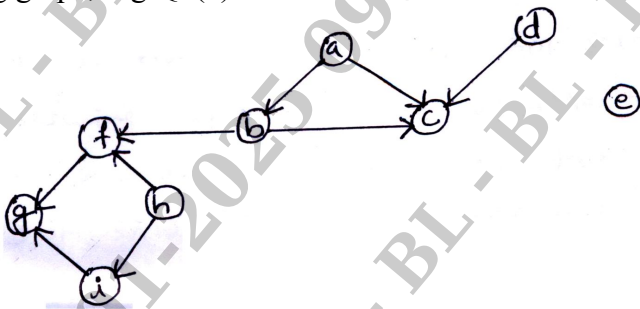
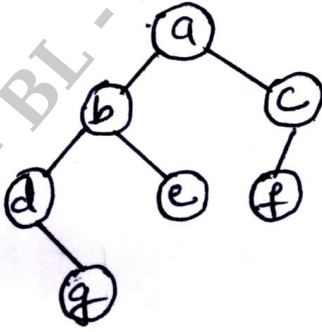
Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Analysis and Design of Algorithms

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the various steps in algorithm design and analysis process with the flow diagram.	08	L1	CO1
	b.	Give formal and informal definitions of asymptotic notations.	06	L1	CO1
	c.	Explain the general plan of mathematical analysis of recursive algorithm with an example.	06	L1	CO1
OR					
Q.2	a.	Design algorithm for tower of Hanoi problem and obtain time complexity.	10	L1	CO1
	b.	Write an algorithm to search an element in an array using sequential search. Discuss the best case, worst case and average case efficiency of this algorithm.	10	L1	CO1
Module – 2					
Q.3	a.	Write an algorithm to sort the numbers using insertion sort. Discuss its efficiency.	10	L2	CO2
	b.	Design quick sort algorithm and obtain its best, average and worst case efficiency.	10	L2	CO2
OR					
Q.4	a.	Write merge sort algorithm and sort the list E X A M P L E.	08	L2	CO2
	b.	Apply the DFS based algorithm to solve the topological sorting problem for the following graph, Fig.Q4(b)	06	L3	CO2
 Fig.Q4(b)					
	c.	Write algorithm for pre-order, post order and in order traversals of a tree. Write pre-order, in-order and post order for the given tree.	06	L2	CO2
		 Fig.Q4(c)			

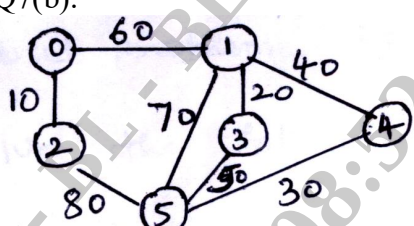
Module – 3

Q.5	a.	Define AVL tree. Construct AVL tree for the list 5, 6, 8, 3, 2, 4, 7.	10	L3	CO3
	b.	Define heap. Sort the following lists by heapsort: H E A P S O R T (in alphabetical order)	10	L3	CO3

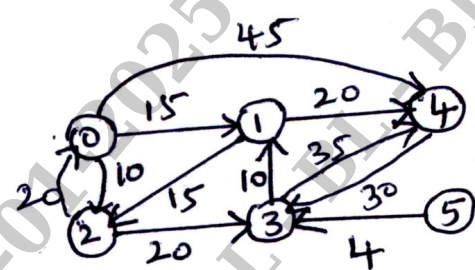
OR

Q.6	a.	Write the algorithm for comparison counting sort. Discuss its efficiency.	10	L2	CO4
	b.	Design Horspools algorithm for string matching. Apply Horspools algorithm to find the pattern BARBER on the text JIM SAW ME IN BARBERSHOP	10	L3	CO4

Module – 4

Q.7	a.	Write Warshall's algorithm and apply the same to compute transitive closure of a directed graph. <table border="1"> <tr> <td></td> <td>a</td> <td>b</td> <td>c</td> <td>d</td> <td>e</td> </tr> <tr> <td>a</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>b</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>c</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>d</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>e</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> </table>		a	b	c	d	e	a	1	0	0	1	0	b	0	1	0	0	0	c	0	0	0	1	1	d	1	0	0	0	0	e	0	1	0	0	1	10	L3	CO3
	a	b	c	d	e																																				
a	1	0	0	1	0																																				
b	0	1	0	0	0																																				
c	0	0	0	1	1																																				
d	1	0	0	0	0																																				
e	0	1	0	0	1																																				
	b.	Construct minimum cost spanning tree using Kruskal's algorithm for the following graph, Fig.Q7(b). 	10	L3	CO4																																				

OR

Q.8	a.	Solve the following single source shortest path problem assuming vertex '5' as the source. 	10	L3	CO4														
	b.	Write Huffman's algorithm. Construct Huffman tree and resulting code word for the following: <table border="1" data-bbox="303 1747 909 1823"><tr><td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>-</td></tr><tr><td>Probability</td><td>0.5</td><td>0.35</td><td>0.5</td><td>0.1</td><td>0.4</td><td>0.2</td></tr></table> Encode the text DAD CBE.	Character	A	B	C	D	E	-	Probability	0.5	0.35	0.5	0.1	0.4	0.2	10	L4	CO4
Character	A	B	C	D	E	-													
Probability	0.5	0.35	0.5	0.1	0.4	0.2													

Module – 5

Q.9	a.	Explain the following with example: (i) P problem (ii) NP problem	06	L1	CO5
	b.	What is decision tree? Construct decision tree for the three element insertion sort.	08	L2	CO5
	c.	Construct state space tree to solve 4 queens problem.	06	L3	CO5

OR

Q.10	a.	What is backtracking? Apply back tracking to solve the below instance of sum of subset problem: $s = \{3, 5, 6, 7\}$, $d = 15$	10	L3	CO6															
	b.	Solve the following instance of knapsack problem using branch and bound technique knapsack capacity = 10. <table><tr><td>Item</td><td>Weight</td><td>Value</td></tr><tr><td>1</td><td>4</td><td>40</td></tr><tr><td>2</td><td>7</td><td>42</td></tr><tr><td>3</td><td>5</td><td>25</td></tr><tr><td>4</td><td>3</td><td>12</td></tr></table>	Item	Weight	Value	1	4	40	2	7	42	3	5	25	4	3	12	10	L4	CO6
Item	Weight	Value																		
1	4	40																		
2	7	42																		
3	5	25																		
4	3	12																		

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Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Microcontroller

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the purpose of various fields of current program status register with a neat diagram.	05	L2	CO1
	b.	Explain the ARM design philosophy.	06	L2	CO1
	c.	Explain the core extensions of ARM processor with neat block diagram.	09	L2	CO1
OR					
Q.2	a.	Explain Embedded systems hardware with a neat block diagram.	06	L2	CO1
	b.	What is pipelines in ARM? Illustrate with an example the pipeline stage of ARM 9 and ARM 10.	09	L2	CO1
	c.	Describe the RISC design philosophy with 4 design rules.	05	L2	CO1
Module – 2					
Q.3	a.	Explain the following with examples : (i) RSC (ii) MLA (iii) STRH (iv) SWP	10	L2	CO2
	b.	Explain the different data processing instruction in ARM.	10	L2	CO2
OR					
Q.4	a.	Explain Barrel shifter instruction in ARM with suitable examples.	10	L2	CO2
	b.	Explain the different branch instruction of ARM processor.	05	L2	CO2
	c.	Explain co-processor instruction of ARM processor.	05	L2	CO2
Module – 3					
Q.5	a.	Explain the different basic data types in C. Provide examples of how each data type can be used in a C program.	08	L2	CO3
	b.	Discuss the concept of register allocation in compiler optimization. Illustrate its significance with an example.	07	L2	CO3
	c.	Describe the process of a function call in C.	05	L2	CO3
OR					
Q.6	a.	Discuss the common portability issues faced when writing C programs. How can these issues be mitigated.	07	L2	CO3
	b.	Explain the concept of pointer aliasing with example.	07	L2	CO3
	c.	How are function calls handled efficiently in calling function in C?	06	L2	CO3
Module – 4					
Q.7	a.	What are interrupts? Discuss interrupt vector table with diagram for ARM processor.	06	L2	CO4
	b.	Describe the sequence of operations that occurs when an ARM processor handles an IRQ exceptions.	06	L2	CO4
	c.	Discuss the priority system for exception in ARM processor.	08	L2	CO4
OR					
Q.8	a.	Explain the role of the link register in ARM exception handling.	08	L2	CO4
	b.	Explain the design and implementation of an interrupt stack in a ARM-based system. Explain the steps involved.	08	L2	CO4
	c.	What are the key differences between a boot loader and firmware?	04	L2	CO4

Module – 5					
Q.9	a.	Explain the basic operation of a cache controller.	06	L2	CO5
	b.	With a neat diagram, explain the basic architecture of a cache memory.	10	L2	CO5
	c.	Mention any 4 relationship between cache and main memory.	04	L2	CO5
OR					
Q.10	a.	Write a note on cache write policy both write back or write through.	10	L2	CO5
	b.	Describe the allocation policy on a cache miss.	04	L2	CO5
	c.	Write a note on following : (i) Write buffers (ii) Cache efficiency	06	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Database Management System

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C																																									
Q.1	a.	Define the following terms: (i) Database (ii) Schema (iii) Entity (iv) DDL (v) Degree of a relationship	05	L1	CO1																																									
	b.	Briefly explain characteristics of database approach.	05	L2	CO1																																									
	c.	List and explain advantages of using DBMS approach.	10	L2	CO1																																									
OR																																														
Q.2	a.	Define the following terms: (i) Cardinality (ii) Weak entity (iii) Program data independence (iv) DML (v) Value sets	05	L1	CO1																																									
	b.	Describe three-schema architecture. Why do we need mappings between schema levels?	05	L2	CO1																																									
	c.	Explain different types of attributes in ER model with suitable example for each.	10	L2	CO1																																									
Module – 2																																														
Q.3	a.	With suitable example, explain the entity integrity and referential integrity constraints. Why each is considered important?	05	L2	CO2																																									
	b.	Discuss equijoin and natural join with suitable example using relational algebra notation.	05	L2	CO2																																									
	c.	Given the relational tables: <table><tr><td colspan="4">Employee:</td><td colspan="2">Department:</td></tr><tr><td>EID</td><td>Name</td><td>DepID</td><td>Salary</td><td>DeptID</td><td>DeptName</td></tr><tr><td>1</td><td>Alice</td><td>10</td><td>5000</td><td>10</td><td>HR</td></tr><tr><td>2</td><td>Bob</td><td>20</td><td>6000</td><td>20</td><td>IT</td></tr><tr><td>3</td><td>Eve</td><td>20</td><td>6500</td><td>30</td><td>Sales</td></tr></table> Project <table><tr><td>PID</td><td>Project Name</td><td>DeptID</td></tr><tr><td>101</td><td>Project Alpha</td><td>10</td></tr><tr><td>102</td><td>Project Beta</td><td>20</td></tr><tr><td>103</td><td>Project Gamma</td><td>30</td></tr></table> Write relational algebra expression for the following: (i) Find the names and salaries of all employees in the ‘IT’ department. (ii) Find the ID’s and names of employees who are in the ‘IT’ department and have a salary greater than 6000. (iii) Find the ID’s and names of employees who are either in the ‘HR’ department or have a salary greater than 6000. (iv) Find the names of employees who are not in the ‘IT’ department (v) Find the names of employees along with their department names.	Employee:				Department:		EID	Name	DepID	Salary	DeptID	DeptName	1	Alice	10	5000	10	HR	2	Bob	20	6000	20	IT	3	Eve	20	6500	30	Sales	PID	Project Name	DeptID	101	Project Alpha	10	102	Project Beta	20	103	Project Gamma	30	10	L3
Employee:				Department:																																										
EID	Name	DepID	Salary	DeptID	DeptName																																									
1	Alice	10	5000	10	HR																																									
2	Bob	20	6000	20	IT																																									
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101	Project Alpha	10																																												
102	Project Beta	20																																												
103	Project Gamma	30																																												

1 of 3

OR

Q.4	a.	Explain any two operations that change the state of relation in a database. Provide suitable examples.	05	L2	CO2																																												
	b.	Discuss the aggregation functions and grouping in relational algebra with suitable examples.	05	L2	CO2																																												
	c.	Given the relational tables: <table><tr><th colspan="2">Student:</th><th colspan="2">Project:</th></tr><tr><th>SID</th><th>Name</th><th>PID</th><th>Project Name</th></tr><tr><td>a</td><td>Alice</td><td>p</td><td>Alpha</td></tr><tr><td>b</td><td>Bob</td><td>q</td><td>Beta</td></tr><tr><td>c</td><td>Carol</td><td>r</td><td>Gamma</td></tr></table> <table><tr><th colspan="2">Language:</th><th colspan="2">Enrollment:</th></tr><tr><th>LID</th><th>Language Name</th><th>SID</th><th>PID</th></tr><tr><td>x</td><td>Python</td><td>a</td><td>p</td></tr><tr><td>y</td><td>Java</td><td>a</td><td>q</td></tr><tr><td>z</td><td>C++</td><td>b</td><td>q</td></tr><tr><td></td><td></td><td>c</td><td>r</td></tr></table> Write relational algebra expression for the following: (i) Rename the student table to Learner and display it. (ii) Find the students (learners) who are not enrolled in any project. (iii) Find the students who are enrolled in all projects. (iv) Find the students who are not enrolled in any project. (v) Find the students who are enrolled in both the 'Alpha' and 'Beta' projects.	Student:		Project:		SID	Name	PID	Project Name	a	Alice	p	Alpha	b	Bob	q	Beta	c	Carol	r	Gamma	Language:		Enrollment:		LID	Language Name	SID	PID	x	Python	a	p	y	Java	a	q	z	C++	b	q			c	r	10	L3	CO2
Student:		Project:																																															
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LID	Language Name	SID	PID																																														
x	Python	a	p																																														
y	Java	a	q																																														
z	C++	b	q																																														
		c	r																																														

Module – 3

Q.5	a.	Explain Armstrong inference rules.	05	L2	CO4
	b.	What is the need for normalization? Explain 1NF, 2NF and 3NF with examples.	05	L2	CO4
	c.	What is functional dependency? Write an algorithm to find minimal cover for set of functional dependencies. Construct minimal cover M for set of functional dependencies which are: $E = \{B \rightarrow A, D \rightarrow A, AB \rightarrow D\}$	10	L3	CO4

OR

Q.6	a.	Explain the types of update anomalies in SQL with an example.	05	L2	CO4
	b.	Explain types of JDBC drivers.	05	L2	CO5
	c.	Consider the schema $R = ABCD$, subjected to FDs $F = \{A \rightarrow B, B \rightarrow C\}$, and the non-binary partition $D1 = \{ACD, AB, BC\}$. State whether D1 is a lossless decomposition? [give all steps in detail].	10	L3	CO4

Module – 4

Q.7	a.	Define transaction. Discuss ACID properties.	05	L2	CO5
	b.	With a neat diagram, explain transition diagram of a transaction.	05	L2	CO5
	c.	Demonstrate working of assertion and triggers in SQL with example.	10	L3	CO5

OR

Q.8	a.	Explain cursor and its properties in embedded SQL with suitable example.	05	L2	CO5
	b.	Determine if the following schedule is serializable and explain your reasoning: i) $T1 : R(X)W(X) \quad T2 : R(X)W(X) \quad T1 : COMMIT \quad T2 : COMMIT$ ii) $T1 : W(X)R(Y) \quad T2 : R(X)W(Y) \quad T1 : COMMIT \quad T2 : COMMIT$	05	L2	CO5

	c.	Consider the tables below: Sailors (<u>sid</u> : integer, sname : string, rating : integer, age : real) Boats (<u>bid</u> : integer, bname : string, color : string); Reserves (<u>sid</u> : integer, <u>bid</u> : integer, day : date) Write SQL queries for the following: (i) Write create table statement for reserves. (ii) Find all information of sailors who have reserved boat number 101. (iii) Find the names of sailors who have reserved at least one boat. (iv) Find the names of sailors who have reserved a red boat. (v) Find the average age of sailors for each rating level.	10	L3	CO5
Module – 5					
Q.9	a.	Explain the CAP theorem.	05	L2	CO6
	b.	What is NOSQL graph database? Explain Neo4j.	05	L2	CO6
	c.	Why concurrency control and recovery are needed in DBMS? Demonstrate with suitable examples types of problems that may occur when two simple transactions run concurrently.	10	L3	CO5
OR					
Q.10	a.	Explain basic operations CRUD in MongoDB.	05	L2	CO6
	b.	Explain deadlock prevention protocols.	05	L2	CO5
	c.	Briefly discuss the two-phase locking techniques for concurrency control.	10	L3	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Discrete Mathematical Structures

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define a tautology. Prove that for any propositions p, q, r the compound propositions $\{(p \rightarrow q) \wedge (q \rightarrow r)\} \rightarrow (p \rightarrow r)$ is tautology.	06	L2	CO1
	b.	Establish the validity of the following argument using the rules of inference: $\{p \wedge (p \rightarrow q) \wedge (s \vee r) \wedge (r \rightarrow \sim q)\} \rightarrow (s \vee t)$	07	L2	CO1
	c.	For any two odd integers m and n, show that: (i) $m + n$ is even (ii) mn is odd	07	L2	CO1
OR					
Q.2	a.	Show that the compound proposition $[(p \vee q) \rightarrow r] \Leftrightarrow [(p \rightarrow r) \wedge (q \rightarrow r)]$ for primitive statements p, q, r is logically equivalent.	06	L2	CO1
	b.	Prove the following using law of logic: $p \rightarrow (q \rightarrow r) \Leftrightarrow (p \wedge q) \rightarrow r$	07	L2	CO1
	c.	Determine the truth value of each of the following quantified statements, the universe being the set of all non-zero integers: (i) $\exists x, \exists y, [xy = 1]$ (ii) $\exists x, \forall y, [xy = 1]$ (iii) $\forall x, \exists y, [xy = 1]$ (iv) $\exists x, \exists y, [(2x + y = 5) \wedge (x - 3y = -8)]$ (v) $\exists x, \exists y, [(3x - y = 17) \wedge (2x + 4y = 3)]$	07	L3	CO1
Module – 2					
Q.3	a.	Prove that for each $n \in \mathbb{Z}^+$, $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$.	06	L2	CO2
	b.	Let $a_0 = 1, a_1 = 2, a_2 = 3$ and $a_n = a_{n-1} + a_{n-2} + a_{n-3}$ for $n \geq 3$, prove that $a_n \leq 3^n \forall n \in \mathbb{Z}^+$.	07	L2	CO2
	c.	How many positive integers n can be we form using the digits 3, 4, 4, 5, 5, 6, 7 if we want n to exceed 5,000,000?	07	L3	CO2
OR					
Q.4	a.	By mathematical induction prove that $1.3 + 2.4 + \dots + n(n+2) = \frac{n(n+1)(2n+7)}{6}$	06	L2	CO2
	b.	Find the number of permutations of the letters of the word ENGINEERING such that: (i) All the E's are together (ii) Arrangement begin with N (iii) All the vowels are adjacent.	07	L3	CO2
	c.	Find the coefficient of $a^2b^3c^2d^5$ in the expansion of $(a + 2b - 3c + 2d + 5)^{16}$.	07	L3	CO2
Module – 3					
Q.5	a.	State pigeon hole principle. Prove that if 30 dictionaries in a library contain a total of 61,327 pages then atleast one of the dictionaries must have atleast 2045 pages.	06	L3	CO3
	b.	Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} 3x - 5 & \text{if } x > 0 \\ 1 - 3x & \text{if } x \leq 0 \end{cases}$. Find $f^{-1}(0), f^{-1}(1), f^{-1}(-1), f^{-1}(3), f^{-1}(-6), f^{-1}([-6, 5])$ and $f^{-1}([-5, 5])$	07	L2	CO3
	c.	Draw the Hasse diagram representing the positive divisor of 36.	07	L3	CO3

OR

Q.6	a.	Let $A = \{1, 2, 3, 4\}$ and $B = \{1, 2, 3, 4, 5, 6\}$, (i) How many functions are there from A to B? (ii) How many of these are one to one? (iii) How many functions are there from B to A? (iv) How many of these are onto?	06	L2	CO3
	b.	Let f and g be functions from R to R defined by $f(x) = ax + b$ and $g(x) = 1 - x + x^2$. If $(g \circ f)(x) = 9x^2 - 9x + 3$, determine a and b .	07	L2	CO3
	c.	Let $A = \{1, 2, 3, 4, 6\}$ and R be a relation on A defined by aRb if and only if “ a is multiple of b ”. Write down the relation R , relation matrix $M(R)$ and draw the digraph. List out in degree and out degree.	07	L3	CO3

Module – 4

Q.7	a.	In how many ways 5 number of a's, 4 number of b's and 3 number of c's can be arranged so that all the identical letters are not in a single block?	06	L3	CO4
	b.	Determine the number of positive integers n such that $1 \leq n \leq 100$ and n is not divisible by 2, 3, or 5.	07	L3	CO4
	c.	Solve the recurrence relation $a_{n+2} - 3a_{n+1} + 2a_n = 0$, $a_0 = 1$, $a_1 = 6$.	07	L2	CO4

OR

Q.8	a.	In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs?	06	L3	CO4
	b.	Five teachers T_1, T_2, T_3, T_4 are to be made class teachers for five classes, C_1, C_2, C_3, C_4, C_5 , one teacher for each class. T_1 and T_2 do not wish to become the class teachers for C_1 or C_2 , T_3 and T_4 for C_4 or C_5 , and T_5 for C_3 or C_4 or C_5 . In how many ways can the teachers be assigned the work? (Without displeasing any teacher)	07	L3	CO4
	c.	Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$ and $F_0 = 0$, $F_1 = 1$.	07	L2	CO4

Module – 5

Q.9	a.	If G be a set of all non zero real numbers and let $a * b = \frac{ab}{2}$ then show that $(G, *)$ is an abelian group.	06	L2	CO5
	b.	Define Klein group and if $A = \{e, a, b, c\}$ then show that this is a Klein-4 group.	07	L2	CO5
	c.	State and prove Lagrange's theorem.	07	L2	CO5

OR

Q.10	a.	If H and K are subgroups of group G, prove that $H \cap K$ is also a subgroup of G. Is $H \cup K$ a subgroup of G?	06	L2	CO5																																																	
	b.	Define cyclic group and show that $(G, *)$ whose multiplication table is as given below is cyclic. <table border="1"><tr><td>*</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr><tr><td>a</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr><tr><td>b</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>a</td></tr><tr><td>c</td><td>c</td><td>d</td><td>e</td><td>f</td><td>a</td><td>b</td></tr><tr><td>d</td><td>d</td><td>e</td><td>f</td><td>a</td><td>b</td><td>c</td></tr><tr><td>e</td><td>e</td><td>f</td><td>a</td><td>b</td><td>c</td><td>d</td></tr><tr><td>f</td><td>f</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr></table>	*	a	b	c	d	e	f	a	a	b	c	d	e	f	b	b	c	d	e	f	a	c	c	d	e	f	a	b	d	d	e	f	a	b	c	e	e	f	a	b	c	d	f	f	a	b	c	d	e	07	L2	CO5
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	c.	Let $G = S_4$, for $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$, find the subgroup $H = \langle \alpha \rangle$. Determine the left cosets of H in G.	07	L3	CO5																																																	

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Question Paper Version : A

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
UI/UX

Time: 1 hr.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. Identify which of the following statements best describes the relationship between usability and user experience (UX)?
 - a) Usability is a subset of UX, focusing primarily on how easy and efficient it is for users to achieve their goals.
 - b) UX is a subset of usability, focusing primarily on the technical performance of a product.
 - c) Usability and UX are unrelated concepts, with usability concerning functionality and UX concerning aesthetics only.
 - d) Usability solely determines the emotional impact a product has on its users, which is the essence of UX.
 2. Identify how does emotional impact play a role in user experience (UX)?
 - a) Emotional impact is irrelevant to UX as it only concerns the technical aspects of a product.
 - b) Emotional impact is the primary factor in UX, disregarding usability and functionality.
 - c) Emotional impact complements usability and functionality by enhancing user satisfaction and engagement.
 - d) Emotional impact solely defines the usability of a product.

3. Identify why is it important to build a business case for user experience (UX)?
 - a) A business case for UX is unnecessary because UX improvements do not translate into financial gains.
 - b) Building a business case for UX helps in securing funding and support from stakeholders by demonstrating potential returns on investment through improved customer satisfaction and loyalty.
 - c) A business case for UX should focus solely on the aesthetic enhancements of a product.
 - d) The business case for UX should only be considered after the product has failed in the market.
4. Identify which of the following best describes the role of emotional impact in user experience (UX)?
 - a) Emotional impact is the primary determinant of a products usability.
 - b) Emotional impact enhances the overall user experience by creating positive feelings and engagement with the product.
 - c) Emotional impact is only relevant during the initial interaction with a product.
 - d) Emotional impact is less important than technical performance and functionality in UX.
5. Identify how can emotional impact influence user behavior and perception in the context of user experience (UX)?
 - a) Emotional impact has no influence on user behavior and perception.
 - b) Positive emotional impact can increase user satisfaction, loyalty and the likelihood of recommending the product to others.
 - c) Emotional impact only affects the aesthetic appreciation of a product, not user behavior.
 - d) Negative emotional impact always leads to increased usability issues.
6. Identify what is a key consideration when aiming to create a positive emotional impact in user experience design?
 - a) Focus solely on the visual design elements.
 - b) Understand the target audience's needs, preferences and emotional triggers to design experiences that resonate with them.
 - c) Prioritize functionality over any emotional considerations.
 - d) Avoid any form of user feedback during the design process.
7. Identify what is the first step in extracting interaction design requirements for a UI/UX project?
 - a) Developing high-fidelity prototypes.
 - b) Conducting user research to understand the target audience's needs, behaviors and pain points.
 - c) Creating a detailed project timeline.
 - d) Writing code for the initial version of the product.
8. Identify which method is commonly used to gather user needs and requirements for interaction design?
 - a) A/B testing
 - b) Usability testing
 - c) User interviews and surveys
 - d) Load testing

9. Identify why is it important to involve stakeholders in the process of extracting interaction design requirements?
- a) To ensure that the design aligns with business goals and user needs.
 - b) To decrease the amount of user research needed.
 - c) To speed up the development process by reducing feedback loops.
 - d) To limit the number of design changes during development.
10. Identify what role does creating persona's play in the process of defining interaction design requirements?
- a) Personas are used to test the technical performance of a product.
 - b) Personas help designers understand and visualize the target users, characteristics, needs and goals, guiding design decisions.
 - c) Personas are primarily used to track project timelines and deadlines.
 - d) Persona's are used to develop coding standards for the development team.
11. Design concept includes _____
- a) Usability
 - b) Accessibility
 - c) Both (a) and (b)
 - d) None of these
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15. Identify how do usability tests contribute to refining interaction design requirements?
- a) They eliminate the need for user feedback in the design process.
 - b) They provide direct insights into how real users interact with the design, highlighting areas that need improvement.
 - c) They focus exclusively on the visual aspects of the design.
 - d) They are used only after the final product has been developed.

16. Identify which of the following is a key outcome of properly defined interaction design requirements?
 - a) A visually appealing user interface with minimal functionality.
 - b) An efficient development process with no need for revisions.
 - c) A user-centered design that effectively meets user needs and enhances the overall user experience.
 - d) A decrease in overall project costs.
17. Identify which of the following is a common method used for formal requirement extraction in UI/UX?
 - a) Random sampling
 - b) Stakeholder interviews and workshops.
 - c) Creating high-fidelity prototypes before gathering any user input.
 - d) Implementing the first idea that comes to mind.
18. Which of the following tools is often used to gather user requirements in a structured manner?
 - a) Wireframes
 - b) User personas
 - c) Requirements management software like JIRA or Trello
 - d) CSS frameworks like Bootstrap.
19. Identify what happens if the user has a different mental model than the designer?
 - a) The user will have no impact on the systems usability.
 - b) The designer must redesign the system immediately.
 - c) The system will automatically adapt to the user's mental model.
 - d) The user may misunderstand how to use the system effectively.
20. Identify what is a designer's mental model?
 - a) Physical model of the system's hardware.
 - b) Conceptualization of the envisioned system by the designer.
 - c) List of tasks the system should perform.
 - d) User's understanding of how the system works.
21. Identify what is the main role of a visual designer during the visual design and visual comps phase?
 - a) To create wireframe sequences representing key workflows.
 - b) To annotate wireframes with call-out text and data elements.
 - c) To write detailed documentation language for the design.
 - d) To produce pixel-perfect mockups of the graphical look and feel of the user interface.
22. Identify in the context of intermediate design, what are information objects primarily meant to do?
 - a) Store user interface layouts and graphics.
 - b) Provide a visual representation of system data.
 - c) Be accessed and manipulated by users in their work roles.
 - d) Define the system's color scheme.

23. Identify during intermediate design iteration, high-fidelity mockups can serve to:
- a) Test the final design before launch.
 - b) Create visual compositions for marketing purposes.
 - c) Enhance the systems performance.
 - d) Demonstrate leading conceptual design candidates to upper management.
24. Identify what is a key advantage of using illustrated scenarios in intermediate interaction design documents?
- a) They are suitable only for initial design stages.
 - b) They eliminate the need for textual descriptions.
 - c) They focus only on visual elements without textual support.
 - d) They combine visual and textual communication to share details.
25. Identify what is meant by 'visual comps' in the context of visual design?
- a) Early wireframes defining user workflows.
 - b) Conceptual sketches without precise details.
 - c) Pixel-perfect mockups of the graphical interface.
 - d) Annotated wireframes for iteration and evaluation.
26. Identify what are wireframes primarily used for in the field of interaction design?
- a) Creating high-fidelity visual representations.
 - b) Documenting, communicating and prototyping interaction designs.
 - c) Developing complex algorithms for software.
 - d) Implementing final website designs.
27. Identify which type of prototype is commonly used during the detailed design iteration?
- a) Low-fidelity wireframes
 - b) Paper prototypes
 - c) High-fidelity interactive mockups
 - d) Conceptual sketches
28. Identify what does the term 'information object' refer to, based on the context provided?
- a) A wireframe element used for screen layouts.
 - b) A visual representation of design concepts.
 - c) A navigation element for back and forth movements.
 - d) An internally stored work object shared by users and the system.
29. Identify what is one of the most important aspects to remember about wireframing?
- a) Detailing
 - b) Modularity
 - c) Complexity
 - d) Consistency
30. Identify which user experience goal example is specifically mentioned for a life-critical system?
- a) Ease-of-use
 - b) Safety
 - c) Walk-up-and-use learnability
 - d) Avoiding errors for intermittent users.
31. Identify what is the main purpose of a horizontal prototype?
- a) To provide in-depth detail of a specific feature.
 - b) To optimize the front-end and back-end integration.
 - c) To test the physical interaction of the design.
 - d) To provide an overview of many features with limited functionality.

32. Identify which of the following best describes a 'T' prototype?
- a) It offers a shallow overview with detailed development in a few areas.
 - b) It represents the full system but in a low-fidelity format.
 - c) It focuses exclusively on the depth of a single feature.
 - d) It includes a 3D physical mockup for tangible interaction.
33. Identify why might a team use a local prototype?
- a) To evaluate specific isolated design details.
 - b) To simulate the entire system workflow in high fidelity.
 - c) To provide a fully functional back-end system.
 - d) To combine physical and software elements of a design.
34. Identify what is a significant benefit of using physical prototypes over graphical representations on a screen?
- a) Users can access more detailed information.
 - b) Users experience less usage interference.
 - c) Users find it faster to visualize ideas.
 - d) Users can hold and feel the product as a real object.
35. Identify why are low-fidelity prototypes often kept private within the project team?
- a) They require too much time to update frequently.
 - b) They do not provide any useful feedback.
 - c) They can be misinterpreted by users and customers if not carefully explained.
 - d) They are too expensive to produce for public use.
36. Identify what is the main difference between horizontal and vertical prototypes?
- a) Vertical prototypes offer a shallow design overview, while horizontal prototypes provide in-depth feature details.
 - b) Horizontal prototypes cover a broad range of features with less depth, while vertical prototypes focus extensively on a narrow range of features.
 - c) Horizontal prototypes are fully functional, while vertical prototypes are not.
 - d) Horizontal prototypes are used for localized design issues, while vertical prototypes include full system functionality.
37. Identify what is the primary benefit of using a T prototype?
- a) It provides the lowest possible fidelity for initial designs.
 - b) It entirely replaces the need for horizontal and vertical prototypes.
 - c) It combines both horizontal and vertical prototyping advantages by providing a broad overview with detailed functionality in some areas.
 - d) It is only useful for isolated design issues like a local prototype.
38. Identify why might a design team choose to use a low-fidelity prototype?
- a) Low-fidelity prototypes look exactly like the final system, providing realistic evaluations.
 - b) Low-fidelity prototypes are used exclusively when producing advance sales demos.
 - c) Low-fidelity prototypes allow quick construction and iteration, making them cost-effective and fast to produce.
 - d) Low-fidelity prototypes are required whenever final implementation is imminent.

39. Identify which advantage is described for placing paper prototypes inside mobile devices?
- a) It eliminates the need for any user input.
 - b) Users can interact with the device physically.
 - c) The device will function without any power source.
 - d) It guarantees the prototype is free from any errors.
40. Identify why low-fidelity prototypes should be explained carefully to non-team members?
- a) They require special equipment to understand.
 - b) They are too advanced for the early stages of design.
 - c) They contain highly sensitive information.
 - d) They can be misinterpreted by those not familiar with their use.
41. Identify what are the UX design guidelines used for?
- a) Interpreting design guidelines
 - b) Planning
 - c) Translation
 - d) All of these
42. Identify what is a crucial factor to consider when designing a UX environment?
- a) The color of the interface
 - b) The length of the content
 - c) Human memory limitations
 - d) Who the intended audience is
43. Identify in the context of UX design, what does the term 'Physical Action' refer to?
- a) Incorporating interactive elements into the design
 - b) How the user interacts with the interface
 - c) The orientation of the device
 - d) The physical action the user needs to take to use the product.
44. Identify what comes under the assessment in UX Design Guidelines?
- a) Assessing the design guidelines
 - b) Assessing the outcomes
 - c) Assessing the plan
 - d) All of these
45. Identify what does the term 'Translation' refer to in UX Design?
- a) Translating the design into different languages.
 - b) Transferring the inputs to outputs.
 - c) The conversion of users actions and requirements into design elements.
 - d) Altering the design based on user location.
46. Identify what is the function of 'Outcomes' in UX design?
- a) To plan the next steps
 - b) To measure the success of the design
 - c) To analyze user interaction
 - d) To interpret design guidelines
47. Identify what do UX design guidelines help with?
- a) Improve usability and accessibility
 - b) Increase interface complexity
 - c) Limit design creativity
 - d) Increase the time users spend on the site
48. Identify an example of translation in UX design could be?
- a) Storyboarding
 - b) User flow diagrams
 - c) Wireframing
 - d) Prototyping

49. Identify what does planning in UX design involved?
- a) Brainstorming sessions
 - b) Scoping the project
 - c) Deciding the user interface design
 - d) All of these
50. Identify why are human memory limitations considered while designing a UX environment?
- a) To plan the spacing on the page
 - b) To limit the use of multimedia
 - c) To design the interface in a way that doesn't overload the users memory capacity.
 - d) To decide the colors used in the design.

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