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BCS401

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

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graph TD
    a((a)) --> b((b))
    a((a)) --> c((c))
    b((b)) --> c((c))
    b((b)) --> f((f))
    c((c)) --> f((f))
    c((c)) --> d((d))
    f((f)) --> g((g))
    f((f)) --> h((h))
    h((h)) --> i((i))
    i((i)) --> g((g))
    e((e))
    
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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
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```

graph TD
    a((a)) --- b((b))
    a((a)) --- c((c))
    b((b)) --- d((d))
    b((b)) --- e((e))
    c((c)) --- f((f))
    d((d)) --- g((g))
    
```

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. $ \begin{array}{c} a \quad b \quad c \quad d \quad e \\ a \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix} \end{array} $	10	L3	CO3
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b.	Construct minimum cost spanning tree using Kruskal's algorithm for the following graph, Fig.Q7(b).	10	L3	CO4
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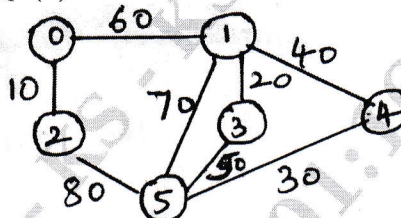


Fig.Q7(b)

OR

Q.8	a.	Solve the following single source shortest path problem assuming vertex '5' as the source.	10	L3	CO4
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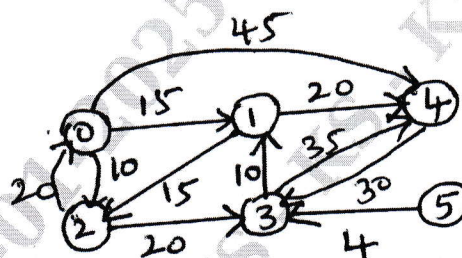


Fig.Q8(a)

b.	Write Huffman's algorithm. Construct Huffman tree and resulting code word for the following:	10	L4	CO4
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Character	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode the text DAD_CBE.

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.	10	L4	CO6															
		<table border="1"> <thead> <tr> <th>Item</th> <th>Weight</th> <th>Value</th> </tr> </thead> <tbody> <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> </tbody> </table>	Item	Weight	Value	1	4	40	2	7	42	3	5	25	4	3	12			
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1	4	40																		
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BCG402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Computer Graphics and Visualization

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.	List the applications of computer graphics and also mention any two OpenGL libraries.	6	L1	CO1
	b.	Explain the various OpenGL primitive constants for drawing points and line segments with suitable examples.	8	L2	CO1
	c.	What is the use of the following OpenGL functions : i) glutInit() ii) glutInitDisplayMode() iii) glClear() iv) glutCreateWindow v) glutMainLoop() vi) glVertex().	6	L1	CO1
OR					
Q.2	a.	List any six OpenGL polygon fill area primitive constants.	6	L1	CO1
	b.	Explain the Bresenham's line drawing algorithm with an example.	8	L2	CO1
	c.	What is the use of the following OpenGL functions: i) glLoadIdentity() ii) glPointSize() iii) glBegin() iv) glutDisplayFunc() v) glClearColor() vi) glColor().	6	L1	CO1
Module – 2					
Q.3	a.	Illustrate the OpenGL geometric transformation functions.	5	L2	CO2
	b.	Compare the following: i) Rotation about a fixed point ii) Scaling about a fixed point	10	L4	CO2
	c.	Illustrate the 3D rotation transformation matrices.	5	L2	CO2
OR					
Q.4	a.	Illustrate the OpenGL Raster transformation functions.	5	L2	CO2
	b.	Compare the 3D rotation about an axis parallel to one of the coordinate axes and the 3D rotation about the origin.	10	L4	CO2
	c.	Illustrate the basic 2D transformations.	5	L2	CO2
Module – 3					
Q.5	a.	Distinguish the logical classification of input devices.	10	L4	CO3
	b.	Develop a OpenGL program to implement user interaction using GLUT keyboard functions.	10	L3	CO3

OR

Q.6	a.	Distinguish the considerations for designing a graphical user interface.	10	L4	CO3
	b.	Develop a OpenGL program to implement user GLUT menu functions.	10	L3	CO3

Module – 4

Q.7	a.	Illustrate the Two Dimensional Viewing pipeline.	6	L2	CO4
	b.	Make use of the Phong model to demonstrate specular reflection.	10	L3	CO4
	c.	Define the following: i) Point light source ii) Diffuse reflection iii) Specular reflection iv) Luminance.	4	L1	CO4

OR

Q.8	a.	Illustrate the RGB and CMY color models.	6	L2	CO4
	b.	Make use of the Cohen Sutherland Line clipping algorithm to demonstrate line clipping with an example.	10	L3	CO4
	c.	Define the following: i) Clipping window ii) Viewport iii) Two-dimensional viewing transformation iv) Workstation Transformation.	4	L2	CO4

Module – 5

Q.9	a.	Illustrate the 3D viewing pipeline.	6	L2	CO5
	b.	Make use of the depth buffer method to demonstrate the hidden surface removal.	10	L3	CO5
	c.	Define the following: i) Viewpoint ii) Projection plane iii) View-plane normal vector N iv) Look at point.	4	L1	CO5

OR

Q.10	a.	Illustrate the symmetric perspective-projection frustum.	6	L2	CO5
	b.	Make use of OpenGL 3D viewing functions to demonstrate 3D viewing.	10	L3	CO5
	c.	Define the following: i) Image space method ii) Object space method iii) Depth Buffer iv) Back Face Detection.	4	L1	CO5

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BCS403

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 border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <tr> <td colspan="4" style="text-align: center;">Employee:</td> <td colspan="2" style="text-align: center;">Department:</td> </tr> <tr> <td style="text-align: center;">EID</td> <td style="text-align: center;">Name</td> <td style="text-align: center;">DepID</td> <td style="text-align: center;">Salary</td> <td style="text-align: center;">DeptID</td> <td style="text-align: center;">DeptName</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">Alice</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5000</td> <td style="text-align: center;">10</td> <td style="text-align: center;">HR</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Bob</td> <td style="text-align: center;">20</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">20</td> <td style="text-align: center;">IT</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Eve</td> <td style="text-align: center;">20</td> <td style="text-align: center;">6500</td> <td style="text-align: center;">30</td> <td style="text-align: center;">Sales</td> </tr> </table> Project <table border="1" style="margin: 10px auto; width: 60%; border-collapse: collapse;"> <tr> <td style="text-align: center;">PID</td> <td style="text-align: center;">Project Name</td> <td style="text-align: center;">DeptID</td> </tr> <tr> <td style="text-align: center;">101</td> <td style="text-align: center;">Project Alpha</td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;">102</td> <td style="text-align: center;">Project Beta</td> <td style="text-align: center;">20</td> </tr> <tr> <td style="text-align: center;">103</td> <td style="text-align: center;">Project Gamma</td> <td style="text-align: center;">30</td> </tr> </table> Write relational algebra expression for the following: <ol style="list-style-type: none"> (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
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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.	<p>Given the relational tables:</p> <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <table border="1" style="display: inline-table;"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>Write relational algebra expression for the following:</p> <p>(i) Rename the student table to Learner and display it.</p> <p>(ii) Find the students (learners) who are not enrolled in any project.</p> <p>(iii) Find the students who are enrolled in all projects.</p> <p>(iv) Find the students who are not enrolled in any project.</p> <p>(v) Find the students who are enrolled in both the 'Alpha' and 'Beta' projects.</p>	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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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.	<p>Determine if the following schedule is serializable and explain your reasoning:</p> <p>i) $T1 : R(X)W(X) \quad T2 : R(X)W(X) \quad T1 : COMMIT \quad T2 : COMMIT$</p> <p>ii) $T1 : W(X)R(Y) \quad T2 : R(X)W(Y) \quad T1 : COMMIT \quad T2 : COMMIT$</p>	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

CBCS SCHEME

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BCS405A

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 \mathbb{R} to \mathbb{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" style="margin-left: auto; margin-right: auto;"> <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																																																		

CBCS SCHEME

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BBOC407

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Biology for Engineers (CSE)

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.	What is stem cell? Explain its types and list its applications.	7	L2	CO1
	b.	Explain in detail the properties and functions of nucleic acids.	6	L2	CO1
	c.	Explain the importance of special biomolecules.	7	L2	CO1
OR					
Q.2	a.	What is a biomolecule? Explain the classifications of biomolecule.	7	L2	CO1
	b.	Explain the properties and functions of carbohydrates.	6	L2	CO1
	c.	Describe the structure and functions of a cell with a neat diagram.	7	L3	CO1
Module – 2					
Q.3	a.	What is the role of lipids? Outline the process of obtaining biodiesel from lipids.	7	L3	CO2
	b.	Differentiate between PHA and PLA as a bioplastic materials.	6	L4	CO1
	c.	Explain the role of DNA vaccine for rabies and RNA vaccine for COVID-19.	7	L2	CO1
OR					
Q.4	a.	What are the key properties, advantages and limitations of cellulose based water filters.	7	L3	CO2
	b.	How can DNA finger printing be applied to evaluate its effectiveness and reliability in forensic applications.	6	L4	CO1
	c.	Describe the use of meat analogue and plant protein as food.	7	L2	CO2
Module – 3					
Q.5	a.	Deliberate the functioning of brain as CPU system.	7	L3	CO2
	b.	Write a short note on spirometry and ventilator.	6	L2	CO2
	c.	Explain heart as pump system.	7	L3	CO2
1 of 2					

OR

Q.6	a.	Explain eye as a camera system.	7	L3	CO2
	b.	Write a short note on cardiac pacemaker.	6	L2	CO2
	c.	Explain kidney as purification system.	7	L3	CO2

Module – 4

Q.7	a.	Describe the materials used and engineering applications of Velcro technology.	7	L3	CO3
	b.	Compare the process of photosynthesis to the functioning of photovoltaic cells.	6	L4	CO3
	c.	Explain the HBOCs and PFCs as human blood substituents.	7	L3	CO3

OR

Q.8	a.	Explain the terms lotus leaf effect and bird flying.	7	L3	CO3
	b.	Compare biological echolocation and technological echolocation highlighting their applications in navigation and detection.	6	L4	CO3
	c.	Explain the terms shark skin, swim suits and bullet train using biological concepts.	7	L3	CO3

Module – 5

Q.9	a.	Compare the functioning of electrical tongue and human tongue.	7	L4	CO4
	b.	Explain muscle cells as scaffold for tissue growth.	6	L2	CO4
	c.	Explain bioremediation and biomining via microbial surface adsorption.	7	L2	CO4

OR

Q.10	a.	Illustrate the basic steps of bioprinting process and list the various types of bioprinting techniques.	7	L4	CO4
	b.	Write a short note on: i) Importance of DNA origami ii) Self healing bioconcrete.	6	L2	CO4
	c.	Discuss the applications of artificial intelligence in the diagnosis of disease.	7	L2	CO4
