



|| Jai Sri Gurudev ||

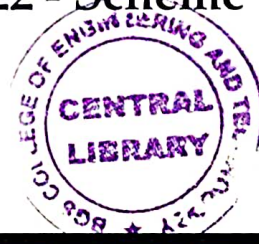


BGSKH Education Trust(R.) - A unit of Sri Adichunchanagiri Shikshana Trust(R.)  
**BGS College Of Engineering and Technology**



**VTU - June / July. 2024 - IV Sem Question Papers**

**2022 - Scheme**





||Jai Sri Gurudev ||  
BGSKH Education Trust (R.) – A unit of Sri Adichunchanagiri Shikshana Trust(R.)  
**BGS College of Engineering and Technology**  
Mahalakshimpuram, West of Chord Road, Bengaluru-560086  
(Approved by AICTE, New Delhi and Affiliated to VTU, Belagavi)

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## IV Semester Question Papers June/July - 2024

Sl.No	Name of the Subject	Subject Code
1	Analysis and Design of Algorithms	BCS401
2	Advanced Java	BIS402
3	Microcontrollers	BCS402
4	Computer Graphics and Visualization	BCG402
5	Artificial Intelligence	BAD402
6	Database Management Systems	BCS403
7	Discrete Mathematical Structures	BCS405A
8	Graph Theory	BCS405B
9	Biology for Engineers (CSE)	BBOC407
10	Universal Human Values Course	BUHK408





# CBCS SCHEME

USN

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BCS401

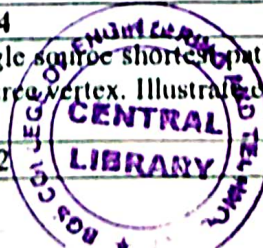
## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Analysis and Design of Algorithms

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.	What is an algorithm? Explain the fundamentals of algorithmic problem solving.	10	L2	CO1
	b.	Develop an algorithm to search an element in an array using sequential search. Calculate the best case, worst case and average case efficiency of this algorithm.	10	L3	CO1
<b>OR</b>					
Q.2	a.	Explain asymptotic notations with example.	10	L2	CO1
	b.	Give the general plan for analyzing the efficiency of the recursive algorithm. Develop recursive algorithm for computing factorial of a positive number. Calculate the efficiency in terms of order of growth.	10	L3	CO1
<b>Module - 2</b>					
Q.3	a.	Explain Strassen's matrix multiplication approach with example and derive its time complexity.	10	L3	CO2
	b.	What is divide and conquer? Develop the quick sort algorithm and write its best case. Make use of this algorithm to sort the list of characters: E, X, A, M, P, L, E.	10	L2	CO2
<b>OR</b>					
Q.4	a.	Distinguish between decrease & conquer and divide & conquer algorithm design techniques with block diagram. Develop insertion sort algorithm to sort a list of integers and estimate the efficiency.	10	L3	CO2
	b.	Define topological sorting. List the two approaches of topological sorting and illustrate with examples.	10	L2	CO2
<b>Module - 3</b>					
Q.5	a.	Define AVL tree with an example. Give worst case efficiency of operations on AVL tree. Construct an AVL tree of the list of keys: 5, 6, 8, 3, 2, 4, 7 indicating each step of key insertion and rotation.	10	L3	CO3
	b.	Define Heap. Explain the bottom-up heap construction algorithm. Apply heap sort to sort the list of numbers 2, 9, 7, 6, 5, 8 in ascending order using array representation.	10	L3	CO3
<b>OR</b>					
Q.6	a.	Define 2-3 tree. Give the worst case efficiency of operations on 2-3 tree. Build 2-3 tree for the list of keys 9, 5, 8, 3, 2, 4, 7 by indicating each step of key insertion and node splits.	10	L3	CO3
	b.	Design Horspool algorithm for string matching. Apply this algorithm to find the pattern BARBER in the text: JIM SAW ME IN A BARBERSHOP	10	L3	CO3
<b>Module - 4</b>					
Q.7	a.	Apply Dijkstra's algorithm to find the single source shortest path for given graph [Fig. Q7(a)] by considering 's' as source vertex. Illustrate each step.	10	L3	CO4





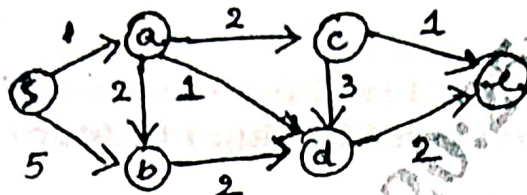


Fig. Q7(a)

- b. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Illustrate using the following directed graph.

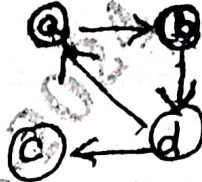


Fig. Q7(b)

OR

- Q.8 a. Define minimum spanning tree. Write Kruskal's algorithm to find minimum spanning tree. Illustrate with the following undirected graph.

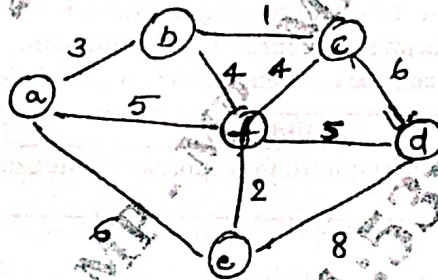


Fig. Q8(a)

- b. Construct Huffman Tree and resulting code for the following:

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

- (i) Encode the text : ABACABAD  
(ii) Decode the text : 100010111001010

Module - 5

- Q.9 a. Explain n-Queen's problem with example using backtracking approach.

- b. Solve the following instance of the knapsack problem by the branch-and-bound algorithm. Construct state-space tree.

Item	Weight	Value
1	4	\$ 40
2	7	\$ 42
3	5	\$ 25
4	3	\$ 12

The knapsack's capacity  $W$  is 10.

OR

- Q.10 a. Differentiate between Branch and Bound technique and Backtracking. Apply backtracking to solve the following instance of subset-sum problem  $S = \{3, 5, 6, 7\}$  and  $d = 15$ . Construct a state space tree.

- b. Explain greedy approximation algorithm to solve discrete knapsack problem.

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# CBGS SCHEME

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BIS402

## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Advanced Java

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 collection Framework? Explain the methods defined by the following Interfaces: (i) Collection (ii) List (iii) Sorted Set (iv) Queue	10	L2	CO1	
	b.	What are Legacy Classes? Explain any four legacy classes of Java's collection Framework with suitable program.	10	L2	CO1	
OR						
Q.2	a.	Explain how collectors can be accessed using an iterator with example.	5	L3	CO1	
	b.	What are the various changes that collection framework underwent recently?	5	L1	CO1	
	c.	With an example program, explain how to store user-defined classes in collections.	10	L2	CO1	
Module - 2						
Q.3	a.	Explain any two character extraction methods of string class.	5	L2	CO2	
	b.	Explain the various string constructors used in Java with examples.	10	L2	CO2	
	c.	Explain additional string methods.	5	L2	CO2	
OR						
Q.4	a.	Briefly describe special string operations with syntax and examples.	5	L2	CO2	
	b.	Explain the following methods of string buffer class with examples : (i) capacity () (ii) reverse () (iii) insert (iv) append ()	10	L2	CO2	
	c.	Explain any four string modification methods of string class.	5	L2	CO2	
Module - 3						
Q.5	a.	Explain the four types of the swing buttons, with demonstration program.	10	L3	CO3	
	b.	Explain MVC connector Architecture.	5	L2	CO3	
	c.	What are the two key swing features? Discuss.	5	L1	CO3	
OR						
Q.6	a.	Explain the following : (i) JLabel and Image Icon. (ii) JTextField	10	L2	CO3	
	b.	Write a program to demonstrate a simple swing application.	10	L3	CO3	
Module - 4						
Q.7	a.	Explain the life cycle of Servlets.	5	L2	CO4	
	b.	Describe the core interfaces that are provided in Jakarta (Javax), Servlet, http package.	5	L2	CO4	
	c.	Define JSP. Explain the different types of JSP tags by taking suitable example.	10	L2	CO4	
OR						



Q.8	a.	Explain any two cookies method.	5	L1	CO4
	b.	With a code, explain how to handle HTTP get requests and HTTP post requests.	10	L2	CO4
	c.	Explain how cookies can be handled using servlets.	5	L4	CO4
Module - 5					
Q.9	a.	Explain different steps involved in JDBC process with a code snippet.	10	L3	CO5
	b.	List and elaborate Database Metadata Object methods.	5	L2	CO5
	c.	List and explain three kinds of exception occurred in JDBC.	5	L2	CO5
OR					
Q.10	a.	Mention all steps to create the association between the database and a JDBC/ODBC bridge.	12	L3	CO5
	b.	Explain the four types of JDBC drivers.	8	L2	CO5

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# CBCS SCHEME

USN

BAD402

## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Artificial Intelligence

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 Artificial Intelligence. Explain the foundation of AI in detail.	10	L1	CO1														
	b.	Explain all four different approaches to AI in detail.	10	L1	CO1														
OR																			
Q.2	a.	Give PEAS specification for : i) Automated taxi driver ii) Medical diagnostic system.	10	L1	CO1														
	b.	Differentiation : i) Fully observable Vs partially observation ii) Single agent Vs Multiagent iii) Deterministic Vs stochastic iv) Static Vs Dynamic.	10	L1	CO1														
Module - 2																			
Q.3	a.	Explain five components and well defined problem. Consider an 8-puzzle problem as an example and explain.	10	L2	CO2														
	b.	Discuss in detail in Infrastructure for search algorithm.	10	L2	CO2														
OR																			
Q.4	a.	Write an algorithm for Breadth - first search and explain with an example.	10	L2	CO2														
	b.	Explain Depth first search techniques in detail.	10	L2	CO2														
Module - 3																			
Q.5	a.	Explain the A* search to minimize the total estimated cost.	10	L3	CO3														
	b.	Write an algorithm for hill climbing search and explain in detail.	10	L3	CO3														
OR																			
Q.6	a.	In the below graph, find the path from A to G. Using Greedy Best First search and A* search algorithm. The values in the table represent heuristic values of reaching the goal node G pass current node.	10	L3	CO3														
	<p style="text-align: center;">Fig Q6(a)</p>		<table border="1" style="border-collapse: collapse;"> <tr><td>A</td><td>5</td></tr> <tr><td>B</td><td>6</td></tr> <tr><td>C</td><td>4</td></tr> <tr><td>D</td><td>3</td></tr> <tr><td>E</td><td>3</td></tr> <tr><td>F</td><td>1</td></tr> <tr><td>G</td><td>0</td></tr> </table>		A	5	B	6	C	4	D	3	E	3	F	1	G	0	
A	5																		
B	6																		
C	4																		
D	3																		
E	3																		
F	1																		
G	0																		



	b.	Explain the syntax and semantion of propositional logic.	10	L3	CO3
<b>Module – 4</b>					
Q.7	a.	Explain the syntax and semantics of the first order logic.	10	L2	CO2
	b.	Explain the following with respect to the first order logic i) Assertions and Queries in first order logic ii) The Kinship domain iii) Numbers, sets and lists.	10	L2	CO2
<b>OR</b>					
Q.8	a.	Explain unification and lifting in detail.	10	L3	CO4
	b.	Explain Forward chaining algorithm with an example.	10	L3	CO4
<b>Module – 5</b>					
Q.9	a.	Explain basic probability Notation in detail.	10	L3	CO5
	b.	Explain Baye's rule and its use in detail.	10	L3	CO5
<b>OR</b>					
Q.10	a.	Explain Independence in Quantifying uncertainty with example.	10	L3	CO5
	b.	Explain knowledge Acquiring in detail.	10	L3	CO5

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# CBCS SCHEME

BCG402

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## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 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.	What is computer graphics? Explain applications of computer graphics with examples.	10	L2	CO1
	b.	Explain in detail graphics pipeline architecture.	10	L2	CO1
OR					
Q.2	a.	With necessary steps explain Bresenham's line drawing algorithm. Consider the line from (6, 6) to (12, 8). Use the algorithm to rasterize the line.	10	L3	CO1
	b.	Explain the various graphics functions with example.	10	L2	CO1
Module - 2					
Q.3	a.	Explain 2D geometric transformations in detail.	10	L2	CO2
	b.	Develop OpenGL program to create and rotate a triangle about the origin and fixed point.	10	L3	CO2
OR					
Q.4	a.	Explain homogeneous co-ordinate representation.	10	L2	CO2
	b.	Develop OpenGL program to create and rotate cube.	10	L3	CO2
Module - 3					
Q.5	a.	Explain in detail various logical devices.	10	L2	CO3
	b.	Explain traditional animation technique in detail with example.	10	L2	CO3
OR					
Q.6	a.	Explain input modes in detail with neat diagram.	10	L2	CO3
	b.	Explain character animation and periodic motions in detail.	10	L2	CO3
Module - 4					
Q.7	a.	Explain Cohen-Sutherland algorithm with example and neat diagram.	10	L3	CO4
	b.	Explain in detail, The Phong Lighting model.	10	L2	CO4
OR					
Q.8	a.	Explain color models.	10	L2	CO4
	b.	Write a short note on (i) Normalization and View port transformation. (ii) 2D point clipping.	06 04	L4	CO3
Module - 5					
Q.9	a.	Explain the concept of hidden surface removal.	10	L2	CO5
	b.	Explain perspective projection with neat diagram.	10	L2	CO5
OR					
Q.10	a.	Develop OpenGL program to draw a polygon and allow user to move the camera suitably to experiment with perspective viewing.	10	L3	CO5
	b.	Explain orthographic and axonometric projection. Bring out the differences.	10	L2	CO5

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# CBCS SCHEME

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**Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024**  
**Microcontrollers**

Max. Marks: 100

Time: 3 hrs.

*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 architecture of an arm embedded device with a neat diagram.	10	L2	CO1
	b.	How are monitor and control internal operations performed in ARM core? Explain in brief.	10	L2	CO1
<b>OR</b>					
Q.2	a.	Explain memory management in ARM core. Compare cache and tightly coupled memory.	10	L2	CO1
	b.	Explain mechanism applied by ARM core to handle exception, interrupts using different vector table.	10	L2	CO1
<b>Module - 2</b>					
Q.3	a.	Examine data processing instructions requirement in the manipulation of data register? Explain in brief data processing instructions.	10	L2	CO2
	b.	Explain with examples the following 32-bit instruction of ARN processor i) CMN ii) MLA iii) MRS iv) BIC v) LDR.	10	L2	CO2
<b>OR</b>					
Q.4	a.	Explain the following with example: i) Stock operation ii) Swap instructions.	10	L2	CO2
	b.	Explain Branch instructions in ARM with suitable example. Demonstrate Branch instruct usage flow of execution with an example program.	10	L2	CO2
<b>Module - 3</b>					
Q.5	a.	How registers are allocated to optimize the program? Develop an assembly level program to find the sum of first to integer numbers.	10	L2	CO3
	b.	How compiler handles a "for loop" with variable number of iterations N and loop controlling with an example.	10	L2	CO3
<b>OR</b>					
Q.6	a.	Explain the following terms with an appropriate example: i) Pointer Aliasing ii) Portability issues.	10	L2	CO3
	b.	How function calling is efficiently used by ARM through APCS with an example program.	10	L2	CO3
<b>Module - 4</b>					
Q.7	a.	Explain ARM processors exception and modes with a neat diagram.	10	L2	CO4
	b.	Explain exception priorities and link register offset.	10	L2	CO4
<b>OR</b>					
Q.8	a.	List ARM firmware suite features. Explain firmware execution flow and Red Hat Boot.	10	L2	CO4
	b.	Explain IRQ and Fir exception, also to enable and disable IRQ and FIQ interrupts.	10	L2	CO4
<b>Module - 5</b>					
Q.9	a.	Explain basic architecture of cache memory.	10	L2	CO5
	b.	Explain process involved in main memory mapping to a cache memory.	10	L2	CO5
<b>OR</b>					
Q.10	a.	Explain with diagram set associative cache. How are efficiency is measured?	10	L2	CO5
	b.	Briefly explain cache line replacement policies with an example.	10	L2	CO5

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MP - M...





# CBCS SCHEME

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BCS403

## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Database Management Systems

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 database. Elaborate component modules of DBMS and their interactions.	10	L2	CO1																																
	b.	Describe the three-schema architecture. Why do we need mappings among schema levels?	06	L2	CO1																																
	c.	Explain the difference between logical and physical data independence.	04	L2	CO1																																
<b>OR</b>																																					
Q.2	a.	Draw an ER diagram for an COMPANY database with employee, department, project as strong entities and dependent as weak entity. Specify the constraints, relationships and ratios in the ER diagram.	10	L3	CO3																																
	b.	Define the following terms with example for each using ER notations: Entity, attribute, composite attribute, multivalued attribute, participation role.	10	L3	CO3																																
<b>Module - 2</b>																																					
Q.3	a.	Discuss the update operations and dealing with constraint violations with suitable examples.	08	L2	CO2																																
	b.	Illustrate the relational algebra operators with examples for select and project operation.	06	L2	CO2																																
	c.	Discuss the characteristics of relations that make them different from ordinary table and files.	06	L2	CO2																																
<b>OR</b>																																					
Q.4	a.	Perform (i) Student U instructor (ii) Student ∩ Instructor (iii) Student - Instructor (iv) Instructor - Student on the following tables: <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr><th colspan="2">Student</th></tr> <tr><th>Fname</th><th>Lname</th></tr> </thead> <tbody> <tr><td>Susan</td><td>Yao</td></tr> <tr><td>Ramesh</td><td>Shah</td></tr> <tr><td>Johnny</td><td>Kohler</td></tr> <tr><td>Barbara</td><td>Jones</td></tr> <tr><td>Amy</td><td>Ford</td></tr> <tr><td>Jimmy</td><td>Wang</td></tr> <tr><td>Ernest</td><td>Gilbert</td></tr> </tbody> </table> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr><th colspan="2">Instructor</th></tr> <tr><th>Fname</th><th>Lname</th></tr> </thead> <tbody> <tr><td>John</td><td>Smith</td></tr> <tr><td>Ricardo</td><td>Brownc</td></tr> <tr><td>Susan</td><td>Mao</td></tr> <tr><td>Francis</td><td>Johnson</td></tr> <tr><td>Ramesh</td><td>Shah</td></tr> </tbody> </table> </div>	Student		Fname	Lname	Susan	Yao	Ramesh	Shah	Johnny	Kohler	Barbara	Jones	Amy	Ford	Jimmy	Wang	Ernest	Gilbert	Instructor		Fname	Lname	John	Smith	Ricardo	Brownc	Susan	Mao	Francis	Johnson	Ramesh	Shah	04	L3	CO2
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John	Smith																																				
Ricardo	Brownc																																				
Susan	Mao																																				
Francis	Johnson																																				
Ramesh	Shah																																				
	b.	Consider the following relational database schema and write the queries in relational algebra expressions: EMP(Eno, Ename, Salary, Address, Phone, DNo) DEPT(DNo, Dname, DLoc, MgrEno) DEPENDENT(Eno, Dep_Name, Drelation, Dage) (i) List all the employees who reside in 'Belagavi'. (ii) List all the employees who earn salary between 30000 and 40000 (iii) List all the employees who work for the 'Sales' department (iv) List all the employees who have at least one daughter (v) List the department names along with the names of the managers	10	L3	CO2																																



	c.	Consider the two tables $T_1$ and $T_2$ shown below: <table style="display: inline-table; margin-right: 20px;"> <thead> <tr><th colspan="3"><math>T_1</math></th></tr> <tr><th>P</th><th>Q</th><th>R</th></tr> </thead> <tbody> <tr><td>10</td><td>a</td><td>5</td></tr> <tr><td>15</td><td>b</td><td>8</td></tr> <tr><td>25</td><td>a</td><td>6</td></tr> </tbody> </table> <table style="display: inline-table;"> <thead> <tr><th colspan="3"><math>T_2</math></th></tr> <tr><th>A</th><th>B</th><th>C</th></tr> </thead> <tbody> <tr><td>10</td><td>b</td><td>6</td></tr> <tr><td>25</td><td>c</td><td>3</td></tr> <tr><td>10</td><td>b</td><td>5</td></tr> </tbody> </table> <p>Show the results of the following operations:</p> <p>(i) <math>T_1 \bowtie_{T_1.P=T_2.A} T_2</math></p> <p>(ii) <math>T_1 \bowtie_{T_1.Q=T_2.B} T_2</math></p> <p>(iii) <math>T_1 \bowtie_{(T_1.P=T_2.A \text{ AND } T_1.R=T_2.C)} T_2</math></p>	$T_1$			P	Q	R	10	a	5	15	b	8	25	a	6	$T_2$			A	B	C	10	b	6	25	c	3	10	b	5	06	L3	CO2
$T_1$																																			
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$T_2$																																			
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10	b	6																																	
25	c	3																																	
10	b	5																																	
<b>Module - 3</b>																																			
Q.5	a.	Discuss the informal design guidelines for relation schema design.	08	L2	CO4																														
	b.	Define 1NF, 2NF, and 3NF with examples.	06	L2	CO4																														
	c.	Write the syntax for INSERT, UPDATE and DELETE statements in SQL and explain with suitable examples.	06	L2	CO3																														
<b>OR</b>																																			
Q.6	a.	Discuss insertion, deletion and modification anomalies. Why are they considered bad? Illustrate with examples.	10	L2	CO3																														
	b.	Illustrate the following with suitable examples: (i) Datatypes in SQL (ii) Substring Pattern Matching in SQL.	10	L2	CO3																														
<b>Module - 4</b>																																			
Q.7	a.	Consider the following relations: Student( <u>Snum</u> , Sname, Branch, level, age) Class( <u>Cname</u> , meet_at, room, fid) Enrolled( <u>Snum</u> , <u>Cname</u> ) Faculty( <u>fid</u> , fname, deptid) Write the following queries in SQL. No duplicates should be printed in any of the answers. (i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach. (ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled. (iii) For all levels except JR, print the level and the average age of students for that level. (iv) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught. (v) Find the names of students not enrolled in any class.	10	L3	CO3																														
	b.	What do understand by correlated Nested Queries in SQL? Explain with suitable example.	04	L2	CO3																														
	c.	Discuss the ACID properties of a database transaction.	06	L2	CO4																														
<b>OR</b>																																			
Q.8	a.	What are the views in SQL? Explain with examples.	04	L3	CO5																														
	b.	In SQL, write the usage of GROUP BY and HAVING clauses with suitable examples.	06	L2	CO3																														
	c.	Discuss the types of problems that may encounter with transactions that run concurrently.	10	L2	CO5																														



Module – 5					
Q.9	a.	What is the two phase locking protocol? How does it Guarantee serializability.	06	L2	CO5
	b.	Describe the wait-die and wound-wait protocols for deadlock prevention.	08	L2	CO5
	c.	List and explain the four major categories of NOSQL system.	06	L2	CO3
OR					
Q.10	a.	What is Multiple Granularity locking? How is it implemented using intension locks? Explain.	10	L2	CO5
	b.	Discuss the following MongoDB CRUD operations with their formats: (i) Insert      (ii) Delete      (iii) Read	06	L2	CO4
	c.	Briefly discuss about Neo4j data model.	04	L2	CO4

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# CBCS SCHEME

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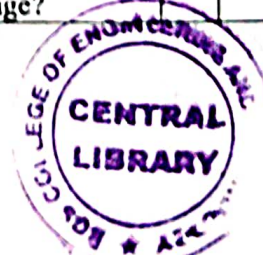
## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 Discrete Mathematical Structures

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 tautology. Prove that for any propositions p, q, r the compound proposition. $[(p \wedge q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$ is a tautology	06	L2	CO1	
	b.	Test whether the following is a valid argument: If Ram studies then he will pass 12 <sup>th</sup> . If Ram passes 12 <sup>th</sup> then his father gifts him a bike. If Ram doesn't play video game then he will pass 12 <sup>th</sup> . Ram did not get a bike. <hr style="width: 50%; margin-left: 0;"/> $\therefore$ Ram played video game.	07	L3	CO1	
	c.	Give direct proofs of the statements: i) If k and l are odd then k + l is even. ii) If k and l are odd then kl is odd.	07	L2	CO1	
<b>OR</b>						
Q.2	a.	Define (i) Proposition (ii) Open statement (iii) Quantifiers	06	L2	CO1	
	b.	Using the laws of logic, prove the following logical equivalence: $[(1p \vee 1q) \wedge (F_0 \vee p) \wedge p] \Leftrightarrow p \wedge 1q$	07	L2	CO1	
	c.	Write the following statement in symbolic form and find its negation: "If all triangles are right angled then no triangle is equilateral".	07	L2	CO1	
<b>Module - 2</b>						
Q.3	a.	Prove by using mathematical induction. $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$	06	L2	CO1	
	b.	How many words can be made with or without meaning from the letters of the word "STATISTICS"? In how many of these a and c are adjacent? In how many vowels are together?	07	L3	CO2	
	c.	Find the coefficient of $x^3y^8$ in the expansion of $(2x - y)^{11}$ .	07	L2	CO2	
<b>OR</b>						
Q.4	a.	Obtain the recursive definition for the sequence in each of the following cases: (i) $a_n = 5n$ (ii) $a_n = 3n + 7$ (iii) $a_n = n^2$ (iv) $a_n = 2 - (-1)^n$	06	L2	CO2	
	b.	A woman has 11 close relations and wishes to invite 5 of them to dinner. In how many ways can she invite them if (i) there is no restriction on her choice. (ii) 2 persons will not attend separately (iii) 2 persons will not attend together.	07	L3	CO2	
	c.	In how many ways can we distribute 7 apples and 5 oranges among 3 children such that each child gets atleast one apple and one orange?	07	L3	CO2	





Module – 3					
Q.5	a.	State pigeon hole principle. Using pigeon hole principle find the minimum number of persons chosen so that atleast 5 of them will have their birthday in the same month.	06	L3	CO3
	b.	Let $A = \{a, b, c, d\}$ and $B = \{1, 2, 3, 4, 5\}$ . Find the number of 1-1 functions and onto functions from (i) A to B (ii) B to A	07	L2	CO3
	c.	Let $A = \{1, 2, 3, 4, 5\}$ . Define a relation R on $A \times A$ by $(x_1, y_1) R (x_2, y_2)$ iff $x_1 + y_1 = x_2 + y_2$ . (i) Verify that R is an equivalence relation (ii) Determine the equivalence class of $[(2, 4)]$	07	L2	CO3
OR					
Q.6	a.	Consider the functions f and g from R to R defined by $f(x) = 2x + 5$ and $g(x) = \frac{1}{2}(x - 5)$ . Prove that g is inverse of f.	06	L2	CO3
	b.	Let $A = \{1, 2, 3, 4\}$ and R be the relation on A defined by $xRy$ if and only if $x < y$ . Write down R as a set of ordered pairs. Write the relation matrix and draw the digraph. List out the in degrees and out degrees of every vertex.	07	L2	CO3
	c.	Let $A = \{1, 2, 3, 6, 9, 12, 18\}$ and define R on A by $xRy$ iff 'x divides y'. Prove that (A, R) is a POSET. Draw the Hasse diagram for (A, R).	07	L2	CO3
Module – 4					
Q.7	a.	How many integers between 1 and 300 (inclusive) are divisible by (i) atleast one of 5, 6 or 8. (ii) None of 5, 6 and 8.	06	L3	CO4
	b.	At a restaurant 10 men handover their umbrellas to the receptionist, In how many ways can their umbrellas be returned so that (i) no man receives his own umbrella. (ii) atleast one gets his own umbrella. (iii) atleast two gets their own umbrellas.	07	L3	CO4
	c.	The number of virus affected files in a system is 1000 (to start with) and this increases by 250% every 2 hours. Use a recurrence relation to determine the number of virus affected files in the system after 12 hours.	07	L3	CO4
OR					
Q.8	a.	In how many ways one can arrange the letters of the word "CORRESPONDENTS" so that there are (i) no pair (ii) atleast 2 pairs of consecutive identical letters.	06	L3	CO4
	b.	4 persons $P_1, P_2, P_3, P_4$ who arrive late for a dinner party find that only one chair at each of five tables $T_1, T_2, T_3, T_4$ and $T_5$ is vacant. $P_1$ will not sit at $T_1$ or $T_2$ . $P_2$ will not sit at $T_2$ . $P_3$ will not sit at $T_3$ or $T_4$ . $P_4$ will not sit at $T_4$ or $T_5$ . Find the number of ways they can occupy the vacant chairs.	07	L3	CO4
	c.	Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \geq 2$ with $a_0 = 5, a_1 = 12$ .	07	L2	CO4
Module – 5					
Q.9	a.	If $*$ is an operation on Z defined by $xy = x + y + 1$ , prove that (Z, $*$ ) is an abelian group.	06	L2	CO5
	b.	Explain Klein-4 group with example.	07	L2	CO5
	c.	State and prove Lagrange's theorem.	07	L2	CO5
OR					
Q.10	a.	Prove that intersection of two subgroups of a group G is also a subgroup of G.	06	L2	CO5
	b.	Prove that $(\mathbb{Z}_4, +)$ is a cyclic group. Find all its generators.	07	L2	CO5
	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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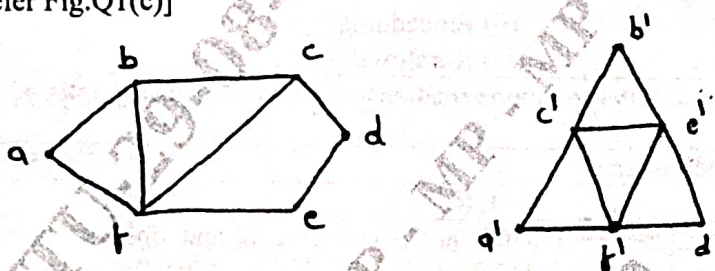
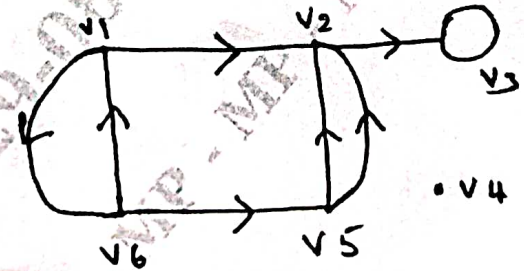
**Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024**

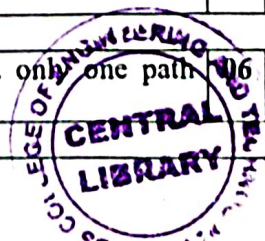
## Graph Theory

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 graph. List and explain the types of graph.	08	L1	CO1	
	b.	Prove that the number of vertices of odd degree in a graph is always even.	06	L2	CO1	
	c.	Define isomorphic graph and verify the following graphs are isomorphic or not. [Refer Fig.Q1(c)]	06	L2	CO1	
<div style="display: flex; justify-content: space-around; align-items: center;">  </div> <p style="text-align: center;">Fig.Q1(c)</p>						
OR						
Q.2	a.	Explain the following graphs: (i) Bi-partite graph (ii) Sub graphs (iii) WALK (iv) Path	10	L1	CO1	
	b.	Prove that a simple graph with n vertices and K components can have at most $(n - K)(n - K + 1)/2$ edges.	10	L2	CO1	
Module - 2						
Q.3	a.	State and prove necessary condition of a graph to be a Euler graph.	10	L2	CO2	
	b.	List and explain the different operations on graph.	10	L2	CO2	
OR						
Q.4	a.	Define digraph. Find the indegree and outdegree of the following graph [Fig.Q4(a)].	08	L2	CO2	
	 <p style="text-align: center;">Fig.Q4(a)</p>					
	b.	Illustrate the travelling salesman problem using a graph.	06	L2	CO2	
c.	List and explain different digraphs and binary relations.	06	L2	CO2		
Module - 3						
Q.5	a.	Define a tree. Prove that in a graph G there is one and only one path between every pair of vertices, G is a tree.	06	L1	CO3	





	b.	Explain the following: (i) Cut-edge      (ii) Cut-vertex      (iii) Cut-set	06	L1	CO3
	c.	Find and construct the following: (i) Minimum possible height of 11 vertex binary tree (ii) A binary tree for a given 11 such that the farthest vertex is as far as possible from the root that must have exactly 2 vertices at each level, except at zero level.	08	L2	CO3
<b>OR</b>					
Q.6	a.	Prove that every circuit has an even number of edges in common with any cut set.	10	L2	CO3
	b.	Prove that ring 50 m of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets.	10	L2	CO3
<b>Module – 4</b>					
Q.7	a.	Define the following: (i) Planar graph      (ii) Embedding (iii) Non-planar      (iv) Kuratowski's 2 graph	08	L2	CO4
	b.	Explain the simple observation mode relationship between planar graph and dual $G^*$ .	08	L2	CO4
	c.	Write a note on path matrix.	04	L1	CO4
<b>OR</b>					
Q.8	a.	Prove that two graphs $G_1$ and $G_2$ are isomorphic if and only if their incidence matrices $A(G_1)$ and $A(G_2)$ differ only by permutations of rows and columns.	10	L2	CO5
	b.	Describe the observations that can be made about circuit matrix $B(G)$ 01 and graph $G$ .	10	L2	CO5
<b>Module – 5</b>					
Q.9	a.	Prove that every tree with two or more vertices is 2 - chromatic.	10	L2	CO5
	b.	Explain the following for chromatic polynomial: (i) Finding a maximal independent set (ii) Finding all maximal independent set.	10	L2	CO5
<b>OR</b>					
Q.10	a.	Prove that the vertices of every planar graph can be properly colored with five colors.	10	L2	CO5
	b.	Explain the Greedy colouring algorithm.	10	L2	CO5

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BBOC407

## Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024 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.	Discuss the various components of Eukaryotic cells.	10	L3	CO1
	b.	Identify the applications of stem cells.	5	L2	CO1
	c.	Explain the functions of vitamins.	5	L2	CO1
<b>OR</b>					
Q.2	a.	Compare Prokaryotic and Eukaryotic cells.	10	L3	CO1
	b.	Explain the properties of Carbohydrates.	5	L2	CO1
	c.	Explain the functions of Lipids.	5	L2	CO1
<b>Module – 2</b>					
Q.3	a.	Highlighting the properties of cellulose, justify cellulose as an effective water filter.	10	L3	CO1
	b.	Explain the working and development of DNA vaccines by taking suitable example.	10	L2	CO1
<b>OR</b>					
Q.4	a.	What are Bioplastics? Justify the use of PHA as Bioplastic mentioning its properties and applications.	10	L3	CO1
	b.	Discuss the following : (i) Meat analogs of protein. (ii) Lipids as cleaning agents.	10	L2	CO1
<b>Module – 3</b>					
Q.5	a.	What is Electro Encephalogram (EEG)? Discuss the types of Brain activity detected with EEG. Write any three applications.	10	L3	CO2
	b.	What are Pace Makers? Explain basic design and construction of Pace Makers.	10	L2	CO2
<b>OR</b>					
Q.6	a.	Justify Lungs as purification system.	10	L3	CO2
	b.	Explain architecture of Rod and Core cells with suitable diagram.	10	L2	CO2
<b>Module – 4</b>					
Q.7	a.	What is ultrasonography? Explain the uses and working principle.	10	L2	CO3
	b.	What is lotus leaf effect? Explain the mechanism and applications of super Hydrophobic effect.	10	L2	CO3
<b>OR</b>					
Q.8	a.	The structure and design of Kingfisher beak lead to the design of Bullet trains. Explain.	10	L2	CO3
	b.	Explain the working and applications of Bionic Leaf Technology.	10	L2	CO3





Module – 5					
Q.9	a.	Explain the use of Electrical tongue in food science.	10	L2	CO4
	b.	Explain the advantages and limitations of Artificial Intelligence for disease diagnosis.	10	L2	CO4
OR					
Q.10	a.	Explain Bioengineering solutions for muscular dystrophy and Osteroporosis.	10	L2	CO4
	b.	Explain most commonly used Bioprinting Techniques.	10	L2	CO4

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- 38 Imaging is \_\_\_\_\_ with time  
 a) Continuous b) Discontinuous c) Random d) Different
- 39 Where there is harmony among the parts of the body it is known as  
 a) Swasthya b) Sanyam c) Prosperity d) None
- 40 Knowing means having the  
 a) Assumption b) Right understanding  
 c) Right feeling d) None
- 41 The purpose of value - Education is to  
 a) Foster universal core values b) Make syllabus easy  
 c) Develop values in individual d) Both A and C
- 42 Self exploration uses two mechanisms i) Natural Acceptance ii) \_\_\_\_\_?  
 a) Experimental validation b) Reason  
 c) Logical Thinking d) Theoretical concept
- 43 Once we know what is valuable to us, these values becomes the basis, the anchor for  
 a) Knowledge b) Actions c) Society d) None of these
- 44 To fulfil Human Aspirations, what are necessary  
 a) Both values and skills b) Values  
 c) Skills d) None of these
- 45 Which the following are, the encompassing principles underlying the successful implementation of value education?  
 A) Conviction B) Connection C) Critical thinking D) Commitment  
 choose the most appropriate answer from the options given below:  
 a) A, C and D only b) B, C and D only c) A, B and D only d) None of these
- 46 Value and skills should go hand in hand  
 a) True b) False  
 c) Cannot tell d) None of these
- 47 Are the content of self - exploration  
 a) Program b) Desire c) Both a and b d) None
- 48 Human life is lived at four levels individual, Family, Society and \_\_\_\_\_  
 a) Nature b) Nurture c) World d) Universe
- 49 Any course content on value education needs to be  
 a) Universal b) Rational c) Natural d) All of these
- 50 Value education enables us to  
 a) To understand our needs  
 b) Visualize our goals correctly  
 c) Indicate the direction for their fulfillment  
 d) All of the above

- 24 Which of the following statement is not true?  
 a) There is inter connectedness in nature  
 b) There is recyclability and self regulation in nature  
 c) There is struggle for survival in nature  
 d) There is mutual fulfillment in nature
- 25 According to quantity, which of the following is true for the orders in nature  
 a) Bio order >> Physical order >> Animal order >> Human order  
 b) Animal order >> Bio order >> Physical order >> Human order  
 c) Physical order >> Bio order >> Animal order >> Human order  
 d) None of the above
- 26 What are the fundamental components of ecosystems?  
 a) Plants and Animals b) Air and water  
 c) Rocks and minerals d) All of these
- 27 The third order of nature is  
 a) Maternal order b) Animal order c) Plant order d) Human order
- 28 The activities in human body are  
 a) Composition b) Decomposition c) Respiration d) All of these
- 29 The systems in nature are  
 a) Cyclic b) Mutually fulfilling  
 c) Both a and b d) None of these
- 30 The natural characteristics/Svabhava of a human being are  
 a) Perseverance b) Bravery c) Generosity d) All of these
- 31 Harmony should be maintained in  
 a) Between body and life  
 b) Between self and society  
 c) Between life and environment  
 d) All of the above
- 32 I being the  
 a) does, sees and Enjoyer b) does  
 c) sees d) enjoyer
- 33 Which of the following is NOT response of the self?  
 a) Knowing b) Assuming c) Recognizing d) Preconditioning
- 34 Activities of self (I) are  
 a) Happiness b) Prosperity  
 c) Desire, thought and expectation d) None
- 35 The requirement of body is right utilization and nurturing  
 a) Desire b) Protection c) Thought d) Expectation
- 36 The \_\_\_\_\_ is an instrument of \_\_\_\_\_  
 a) I, Body b) Body, I c) Both a and b d) None
- 37 The activity of desire, thought and expecting together is called as  
 a) Body b) Health c) Imagination d) Future