

No. of Pages: 02

Roll No.....

C-71

B.Tech. Computer Science & Engineering - CYS III Semester Examinations (June 2026)
Data Structures (BT-CYS-201A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Differentiate between primitive and non-primitive data structures with examples.	2
(b) Determine the time complexity of the following loop: for(i=1;i<n;i=i*2)	2
(c) State any three differences between Quick Sort and Merge Sort.	2
(d) Convert the infix expression into postfix form: (A+B)*(C-D)	2
(e) Define a Complete Binary Tree and Full Binary Tree with suitable example.	2
(f) Define height balanced trees. List general cases to maintain the height.	2

UNIT-I

Q.2(a) What do you understand by time-space tradeoff? Explain best, average and worst cases analysis in this respect with suitable examples.	4
Q.2(b) Analyze the best, average and worst-case complexity of Linear Search.	4
Q.2(b) Write an algorithm to check whether a given string is a palindrome. Apply it on the string: "MALAYALAM".	4
Q.3(a) Compare arrays and linked lists on the basis of: • Memory allocation • Insertion/deletion • Access time • Memory utilization	4
Q.3(b) Write an algorithm/pseudo code to merge two sorted linked lists.	8

UNIT-II

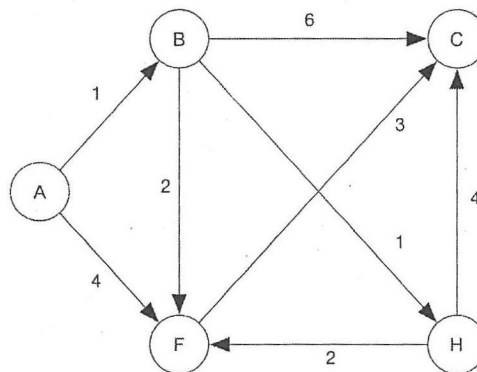
Q.4(a) Apply Quick Sort on the following array using first element as pivot and show partitioning steps: [35, 12, 43, 8, 51, 27].	6
Q.4(b) Is Quick sort a stable sort? Justify your answer with suitable example.	3
Q.4(c) Perform the following operations on an initially empty circular queue of size 5: ENQUEUE(10), ENQUEUE(20), DEQUEUE(), ENQUEUE(40), DEQUEUE(), ENQUEUE(60) Show the status of queue after each operation.	3
Q.5(a) How a circular queue can be implemented using arrays. Write all functions of circular queue operations.	8
Q.5(b) Convert the following infix expression into postfix and prefix forms using stack. (A+B*C)-(D+C). Then evaluate postfix expression for: A=2, B=3, C=4, D=2	4

UNIT-III

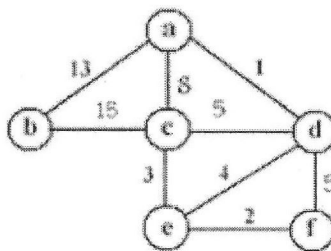
- Q.6(a)** Compare the following tree structures with suitable diagrams and applications: 8
- BST
 - AVL Tree
 - B-Tree
 - Red-Black Tree
- Q.6(b)** Differentiate between B-tree and B+ tree. 4
- Q.7(a)** Explain AVL Trees. Insert the following elements into an AVL Tree and show necessary rotations: 30, 20, 10, 25, 28 6
- Q.7(b)** Construct a Binary Search Tree (BST) for the following sequence: 6
50, 30, 70, 20, 40, 60, 80, 65
Then perform: Inorder , Preorder and Postorder traversals

UNIT-IV

- Q.8(a)** Represent the following graph using Adjacency Matrix and Adjacency List 6
Graph edges: (A,B),(A,C),(B,D),(C,D),(D,E)(A,B).
Perform BFS traversal starting from node A.
- Q.8(b)** Apply Dijkstra's Algorithm to find shortest paths from source vertex A for the 6
graph:



- Q.9(a)** Show shortest distance table after each iteration. 8
Apply Prim's Algorithm to find the Minimum Spanning Tree for the weighted graph below:



- Q.9(b)** Show all intermediate steps and final MST cost. Also write the algorithm. 4
Differentiate between Prim's and Kruskal's algorithm mentioning merits and demerits of both.

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B.Tech. Computer Science & Engineering - CYS III Semester Examinations (June 2026)

Object Oriented Programming (BT-CYS-203A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Define class and object.	2
(b) Explain stack unwinding	2
(c) What is inheritance?	2
(d) Define template.	2
(e) What is a virtual function?	2
(f) Define exception handling.	2

UNIT-I

Q.2(a)	Explain the fundamental concepts of Object-Oriented Programming and illustrate them with suitable real-life examples.	6
Q.2(b)	Examine the role of preprocessor directives in C++ and illustrate how they influence program compilation and code organization with suitable examples.	6
Q.3	Explain the concept of access modifiers (access specifiers) in C++. Explain how access modifiers control the accessibility of data members and member functions inside and outside a class, including their behavior in inheritance.	12

UNIT-II

Q.4	Explain static data members and member functions in C++, and describe how they differ from instance members with suitable examples.	12
Q.5(a)	Write a C++ program to explain dynamic memory allocation in using new and delete.	6
Q.5(b)	Compare and contrast structures and classes in C++. Analyze their roles in object-oriented programming and justify when to use each.	6

UNIT-III

Q.6	Explain base and derived classes with implementation of inheritance in C++. Explain different types of inheritance. Illustrate your answer with a suitable C++ program.	12
Q.7(a)	Explain the concept of operator overloading in C++. Write a program to overload the '+' operator to add two complex numbers.	6
Q.7(b)	Explain function overloading and function overriding in C++. Illustrate both concepts with suitable C++ programs.	6

UNIT-IV

- Q.8** Explain the concept of user-defined exceptions in C++. Discuss their advantages over built-in exceptions. Write a C++ program to create and handle a custom exception for invalid age input (age < 18). **12**
- Q.9(a)** Explain random access in files in C++. Discuss the use of file pointers (seekg, seekp, tellg, tellp) with a suitable program. **6**
- Q.9(b)** Explain class templates in C++. Discuss how they differ from function templates and illustrate with a suitable program. **6**

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B.Tech. Computer Science & Engineering – CYS III Semester Examinations (June 2026)

Mathematical Foundations for Cyber Security (ASH-MAT-207A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory.
Each Question carries 12 marks.

Q.1

- | | | |
|-----|---|---|
| (a) | Salad is made with combination of one or more eatables. How many different salads can be made from onion, tomato, carrot, cabbage and cucumber? | 2 |
| (b) | What do you mean by disjunctive normal form? Illustrate it with an example. | 2 |
| (c) | State Pigeonhole Principle. | 2 |
| (d) | Find the value of x such that $x \equiv 7 \pmod{5}$. | 2 |
| (e) | Do the following congruence possess a solution: $84x \equiv 16 \pmod{35}$. | 2 |
| (f) | What do you mean by algebraic structure? Illustrate with an example. | 2 |

UNIT-I

- | | | |
|--------|--|---|
| Q.2(a) | Prove that
(i) $(A \cup B)' = A' \cap B'$
(ii) $(A \cap B)' = A' \cup B'$ | 6 |
| Q.2(b) | How many integers between 1 and 300 (inclusive) are:
(i) divisible by at least one of 3, 5, 7?
(ii) divisible by 3 and 5, not by 7?
(iii) divisible by 5 but neither by 3 nor by 7? | 6 |
| Q.3(a) | For any propositions p , q and r prove the following:
$(p \uparrow (q \uparrow r)) \Leftrightarrow \sim p \vee (q \wedge r)$. | 6 |
| Q.3(b) | Prove by Mathematical Induction
$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$ | 6 |

UNIT-II

- | | | |
|--------|---|---|
| Q.4(a) | Give an example of a relation which is
(i) Neither reflexive nor irreflexive
(ii) Both symmetric and antisymmetric
(iii) Both reflexive and symmetric
(iv) Each reflexive, symmetric and transitive
(v) Both symmetric and transitive but not reflexive. | 6 |
| Q.4(b) | Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$. Find the transitive closure of R using Warshall's algorithm. | 6 |
| Q.5(a) | Prove that if $h: X \rightarrow Y$ and $k: Y \rightarrow Z$ be two one-to-one onto functions, then $k \circ h$ is also a one-to-one onto function. | 6 |

- Q.5(b)** Solve the recurrence relation $a_{r+2} - 3a_{r+1} + 2a_r = 0$ by the method of generating functions with the initial conditions $a_0 = 2$ and $a_1 = 3$. 6

UNIT-III

- Q.6(a)** State and prove fundamental theorem of arithmetic. 6
- Q.6(b)** State Wilson theorem. Verify $(p - 1)! \equiv -1 \pmod{p}$, when $p = 13$ 6
- (i) Without using Wilson's theorem
- (ii) Using Wilson's theorem.
- Q.7(a)** How do you realize the importance of number theory in the field of Cyber Security? Discuss about RSA and ECC in Cyber Security. 6
- Q.7(b)** Define modular multiplication in congruence. Show that if a, b, c , and m are integers such that $m \geq 2, c > 0$, and $a \equiv b \pmod{m}$, then $ac \equiv bc \pmod{mc}$. 6

UNIT-IV

- Q.8(a)** What do you mean by Semigroup and Monoid? Let $(Z, *)$ be an algebraic structure, where Z is the set of integers and the operation $*$ is defined by $a * b = \text{maximum}(a, b)$. Determine whether $(Z, *)$ is a monoid or a group or an abelian group. 6
- Q.8(b)** If H and K are subgroups of a group G , prove that $H \cap K$ is also a subgroup of G . Is $H \cup K$ a subgroup of G ? Justify your answer. 6
- Q.9(a)** Prove that a finite commutative ring without zero divisors is a field. 6
- Q.9(b)** What do you mean by irreducible polynomials? State and prove Eisenstein's criterion for irreducible polynomials. 6

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C-74

B.Tech. Computer Science & Engineering - CYS III Semester Examinations (June 2026)
Essentials of Cyber Security (BT-CYS-207A)

Time- 3hrs
Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Explain Cyber Extortion.	2
(b) Discuss the role of OS Security.	2
(c) Differentiate between Active and Passive attacks.	2
(d) Explain the concept of Digital Signatures.	2
(e) Describe Password Cracking.	2
(f) State the objectives of Cyber Laws.	2

UNIT-I

Q.2(a)	Apply suitable security measures to protect an organization from cyber threats.	6
Q.2(b)	Suggest methods to secure personal information from cyber criminals during online transactions.	6
Q.3(a)	Apply Risk Analysis techniques to identify vulnerabilities in a banking system.	6
Q.3(b)	Propose security practices to prevent cyber extortion attacks in organizations.	6

UNIT-II

Q.4(a)	Propose methods to protect organizational systems from Password Cracking attacks.	6
Q.4(b)	Apply techniques to secure systems against Phishing and Password Cracking.	6
Q.5(a)	Evaluate the impact of Software Piracy and Intellectual Property violations.	6
Q.5(b)	Analyze Steganography and Spyware attacks in cybersecurity.	6

UNIT-III

Q.6(a)	Apply Data Security considerations such as Backup, Archival, and Data Disposal.	6
Q.6(b)	Assess the importance of OS Security in preventing cyber-attacks.	6
Q.7(a)	Evaluate Hardware Protection and OS Security mechanisms.	6
Q.7(b)	Analyze cybersecurity incident case studies and recommend solutions.	6

UNIT-IV

Q.8(a)	Analyze the importance of Digital Forensics in cybercrime investigations.	6
Q.8(b)	Propose a digital evidence collection strategy for cybercrime investigations.	6
Q.9(a)	Suggest suitable forensic tools for investigating malware attacks in an organization.	6
Q.9(b)	Analyze the legal perspectives of Cyber Security and Cyber Crimes.	6

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B.Tech. Computer Science & Engineering – CS IV Semester Examinations (Jun 2026)
Database Management System (BT-CYS-202A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Define DBMS and list any two advantages of a database system.	1.5
(b)	How is a primary key different from a candidate key?	1.5
(c)	What is the use of triggers in database?	1.5
(d)	What is the difference between delete and drop command in SQL?	1.5
(e)	State the need for normalization of a Database.	1.5
(f)	What is the purpose of indexing in file organization.	1.5
(g)	Define a transaction in DBMS.	1.5
(h)	Justify whether deadlock can occur in Two Phase Locking (2PL) protocol	1.5

UNIT-I

Q.2	Explain the overall database structure and illustrate the interaction among database users, application programs, query processor and storage manager with a suitable diagram	12
Q.3	Design an ER diagram for a University Management System containing entities such as Student, Course, Faculty and Department. Clearly indicate attributes, relationships, cardinality constraints and keys. Convert the ER diagram into relational tables.	12

UNIT-II

Q.4	Explain integrity constraints in the relational data model and analyze their role in maintaining database consistency.	12
Q.5	Consider the given relation schema: Employee(empno, name, branch_id, age, Salary, date_of_joining) Branch(branch_id, branch_name, city, address). Loan(loan_id, emp_no, amount, date, loan_status) Write the following queries in SQL- (4*3) (i) Find the Name and ID of all employees who have borrowed a loan of Rs15lakh or more. (ii) Find details of all employees who applied for loan in year 2010. (iii) Find the branch details having count of active loans more than 5. (iv) Display details of all employees along with loan amount and status.	12

UNIT-III

- Q.6** Explain normalization and analyze the problems caused by data redundancy and update anomalies in unnormalized relations. **12**
- Q.7** Analyze the role of buffer replacement algorithms in improving system performance and compare FIFO and LRU replacement techniques. **12**

UNIT-IV

- Q.8** Consider the following schedules. The actions are listed in the order they are schedule, and prefixed with transaction name.
S1: T1: R(X), T2: R(x), T1: W(Y), T2: W(Y), T1: R(Y), T2: R(Y)
S2:T3: R(X), T1: R(X), T1: W(Y), T2: R (Z), T2: W (Z), T3: R (Z) **12**

For each of the schedules, answer the following questions:

- (i) What type of concurrency problem can occur in schedule S1 and S2.
 - (ii) Draw the precedence graph for the above schedules?
 - (iii) Is the schedule conflict-serializable? Justify your answer
 - (iv) Is the schedule view-serializable? Justify your answer
- Q.9** Explain the significance of logs in recovery and discuss recovery using undo/redo logging with the help of an example. **12**

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D-72

B.Tech. Computer Science & Engineering- CYS IV Semester Examinations (Jun 2026)
Digital Forensics (BT-CYS-204A)

Time- 3hrs
Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) During a memory forensics investigation using Volatility, which plugin is most appropriate for listing all active and terminated processes along with their parent-child relationships?	2
(b) Which type of data is lost when a system is powered off?	2
(c) Which phase of digital forensics is concerned with correlating the collected data to draw any conclusions from it?	2
(d) What is the name of the document that has all the details of the collected digital evidence?	2
(e) What is the purpose of the Windows Prefetch mechanism from a forensic perspective?	2
(f) What is significance of finding a discrepancy between \$STANDARD_INFORMATION and \$FILE_NAME timestamps in an NTFS file?	2

UNIT-I

Q.2(a) Why do cyber forensic experts avoid examining original evidence directly? Which software tools are commonly used for acquiring forensic images of hard drives?	6
Q.2(b) What is the purpose of a write blocker in digital forensic investigations? Discuss the precautions that should be taken while handling powered-on and powered-off devices.	6
Q.3(a) What is the principle of evidence integrity in digital forensics? Discuss how it helps preserve digital evidence during investigations.	6
Q.3(b) Discuss the legal issues involved in digital forensic investigations and explain their impact on the collection and admissibility of digital evidence.	6

UNIT-II

Q.4(a) Discuss the various phases involved in a digital forensic investigation.	8
Q.4(b) What type of evidence can be lost if a system is shut down before forensic acquisition?	4
Q.5(a) What is chain of custody and why is it important during digital evidence handling? Also, explain the concept of hashing with suitable examples.	6
Q.5(b) Why is forensic imaging important in digital investigations?	6

UNIT-III

Q.6(a) Discuss memory analysis in digital forensics using Volatility Framework. Explain the functionality of commonly used plugins.	6
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- Q.6(b) Explain the different fields of an email header and their significance in email forensics. 6
- Q.7(a) Discuss the FAT and NTFS file system in detail. Also, discuss the differences between two filesystems. 6
- Q.7(b) Discuss the importance of order of volatility during evidence collection. What additional data sources can provide information similar to RAM contents? 6

UNIT-IV

- Q.8(a) Explain the structure of the Windows Registry in brief. Also discuss the locations of major hive files and the tools used for registry analysis. 6
- Q.8(b) Explain the advantages and limitations of using Windows Prefetch files as forensic evidence. 6
- Q.9(a) What is significance of shimcache in windows forensics and which registry hive stores the shimcache entries? What does below snapshot of the shimcache entries parsed by AppCompatCacheParser (Eric Zimmerman tool) shows about executable named from 1.exe to 24.exe? 6

0	NA	2020-11-05 01:52:50	C:\Users\davisrg\Desktop\shimcache\5.exe
1	NA	2020-09-14 07:36:54	C:\Users\davisrg\Desktop\shimcache\6.exe
2	NA	2020-09-14 07:33:46	C:\Users\davisrg\Desktop\shimcache\7.exe
3	NA	2020-11-25 14:59:36	C:\Users\davisrg\Desktop\shimcache\8.exe
4	NA	2020-11-25 14:59:36	C:\Users\davisrg\Desktop\shimcache\9.exe
5	NA	2020-04-06 09:25:20	C:\Users\davisrg\Desktop\shimcache\10.exe
6	NA	2020-04-06 09:24:12	C:\Users\davisrg\Desktop\shimcache\11.exe
7	NA	2020-04-06 09:39:46	C:\Users\davisrg\Desktop\shimcache\12.exe
8	NA	2020-04-06 09:38:14	C:\Users\davisrg\Desktop\shimcache\13.exe
9	NA	2020-04-06 09:35:56	C:\Users\davisrg\Desktop\shimcache\14.exe
10	NA	2020-04-06 09:34:20	C:\Users\davisrg\Desktop\shimcache\15.exe
11	NA	2019-09-20 03:17:02	C:\Users\davisrg\Desktop\shimcache\16.exe
12	NA	2019-09-20 03:15:38	C:\Users\davisrg\Desktop\shimcache\17.exe
13	NA	2006-11-01 22:06:08	C:\Users\davisrg\Desktop\shimcache\18.exe
14	NA	2020-06-23 01:19:08	C:\Users\davisrg\Desktop\shimcache\19.exe
15	NA	2020-06-23 01:17:22	C:\Users\davisrg\Desktop\shimcache\20.exe
16	NA	2016-05-27 10:05:22	C:\Users\davisrg\Desktop\shimcache\21.exe
17	NA	2016-05-27 10:02:44	C:\Users\davisrg\Desktop\shimcache\22.exe
18	NA	2021-02-23 00:52:24	C:\Users\davisrg\Desktop\shimcache\23.exe
19	NA	2021-02-23 00:52:24	C:\Users\davisrg\Desktop\shimcache\24.exe
20	NA	2020-11-05 01:52:50	C:\Users\davisrg\Desktop\shimcache\4.exe
21	NA	2006-11-01 22:06:36	C:\Users\davisrg\Desktop\shimcache\3.exe
22	NA	2020-10-16 02:45:26	C:\Users\davisrg\Desktop\shimcache\2.exe
23	NA	2020-10-16 02:45:26	C:\Users\davisrg\Desktop\shimcache\1.exe
24	NA	2021-02-21 06:54:31	C:\Windows\TEMP\8FF56A12-2718-4768-9ACC-E119.

- Q.9(b) Explain the significance of Windows Event Logs in digital forensic investigations. Also explain the location of EVTX files and tools used for parsing them. 6

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D-73

B.Tech. Computer Science & Engineering -CYS IV Semester Examinations (June 2026)
Operating System (BT-CYS-206A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Define operating system and list any two functions of an operating system.	2
(b)	Differentiate between system calls and utility programs.	2
(c)	Explain the role of CPU scheduler in process management.	2
(d)	What is virtual memory? State one advantage of demand paging.	2
(e)	Define semaphore. Differentiate between binary and counting semaphore.	2
(f)	What is deadlock? Mention any one necessary condition for deadlock.	2

UNIT-I

Q.2(a)	Explain the evolution of operating systems with suitable examples.	6
Q.2(b)	Discuss the desirable characteristics and features of modern operating systems.	6
Q.3	Explain operating system services and different ways of providing these services. Also, describe the concept of system calls with suitable examples.	12

UNIT-II

Q.4	Draw and explain the process state diagram. Also, compare FCFS and Round Robin scheduling algorithms with suitable examples.	12
Q.5(a)	Explain paging and segmentation memory management techniques.	6
Q.5(b)	Discuss virtual memory implementation using demand paging.	6

UNIT-III

Q.6	Explain programmed controlled I/O and interrupt driven I/O. Also, discuss the critical section problem and semaphore operations WAIT and SIGNAL.	12
Q.7(a)	What is deadlock? Explain deadlock prevention and avoidance techniques.	6
Q.7(b)	Explain inter-process communication and synchronization in concurrent processes.	6

UNIT-IV

Q.8	Explain different disk space allocation methods used in file systems. Also, discuss directory structures and file protection mechanisms.	12
Q.9(a)	Explain disk scheduling algorithms with suitable examples.	6
Q.9(b)	Write short notes on UNIX/Linux and Windows operating systems.	6

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D-74

B.Tech. Computer Science & Engineering – CYS IV Semester Examinations (Jun 2026)
Design & Analysis of Algorithms (BT-CYS-208A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) How do you compare the performance of various algorithms for the same problem.	2
(b) Differentiate between Big-Oh and Omega notations with suitable example.	2
(c) What is stable sorting method? Is Merge sort a stable sorting method?	2
(d) List the features of Dynamic Programming.	2
(e) Define: i) State Space tree ii) E – Node and iii) Dead Node.	2
(f) Differentiate between DFS and BFS	2

UNIT-I

Q.2(a)	Give the algorithm for transpose of a matrix $m \times n$ and determine the time comp of the algorithm by the frequency-count method.	6
Q.2(b)	Explain about asymptotic notations. Find upper bound, lower bound and tight bound for: $f(n)=7n^3+4n^2-10n+15$	6
Q.3(a)	Solve the recurrence i) $T(n)=3T(n/4)+cn^2$ using recursion tree method. ii) $T(n)=n+2T(n/2)$ using Iteration method. (Given $T(1)=1$)	6
(b)	Solve the following recurrence relations using master method. (i) $T(n)=2T(n/2)+n, T(0)=T(1)=1$ (ii) $T(n)=2T(n/2)+n \log n$	6

UNIT-II

Q.4(a)	Write the algorithm for Binary Search and analyze its complexity.	5
Q.4(b)	State the Job – Sequencing with deadlines problem. Find an optimal sequence to the $n=5$ Jobs where profits $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 5, 1)$ and deadlines $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$. Also, write its algorithm.	7
Q.5(a)	Apply quick sort algorithm to sort the list. E, X, A, M, P, L, E in alphabetical order.	5
Q.5(b)	Formulate the Knapsack problem with greedy method, write its algorithm and find the optimal solution for $n=7, m=15, (p_1-p_7)=(10, 5, 15, 7, 6, 18, 3), (w_1-w_7)=(2, 3, 5, 7, 1, 4, 1)$	7

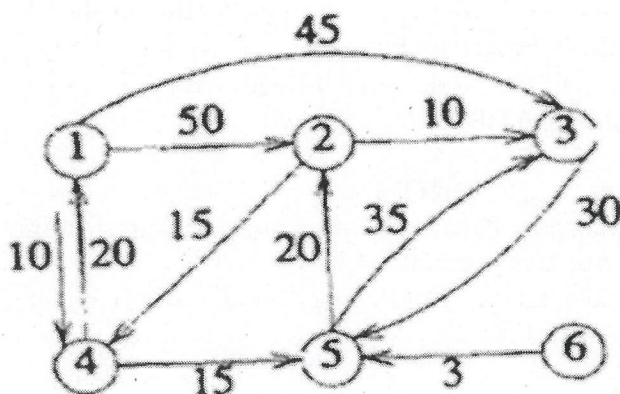
UNIT-III

Q.6(a)	Solve the 0/1 Knapsack problem for: $N=4$, Profit(12,10,20,15), Weight(2,1,3,2), Capacity $W = 5$	4
Q.6(b)	What is a Hamiltonian Cycle? Explain how to find Hamiltonian cycle using backtracking algorithm.	4

- Q.6(c) Find the LCS of following strings using dynamic programming: 4
 $X = \text{'ABRACADABRA'}$
 $Y = \text{'YABBADABBADOO'}$
- Q.7(a) Determine the optimal parenthesization for the matrix chain $A_1(10 \times 30)$, 6
 $A_2(30 \times 5)$, $A_3(5 \times 60)$ using dynamic programming.
- Q.7(b) Explain the Graph – coloring problem. And draw the state space tree for $m =$ 6
 3 colors $n = 4$ vertices graph. Discuss the time and space complexity.

UNIT-IV

- Q.8(a) Distinguish between Prim's and Kruskal's Spanning tree algorithm. 4
- Q.8(b) Compute a minimum cost spanning tree for the graph of figure using prim's 4
algorithm.



- Q.9(b) Generate the actions of shortest paths for the given graph from vertex 1 to all 6
remaining vertices. $1 \rightarrow 2 = 20$, $2 \rightarrow 1 = 2$, $1 \rightarrow 3 = 15$, $2 \rightarrow 5 = 10$, $2 \rightarrow 6 = 30$, $3 \rightarrow 6 = 10$,
 $3 \rightarrow 4 = 4$, $5 \rightarrow 4 = 15$, $6 \rightarrow 4 = 4$, $6 \rightarrow 5 = 10$.
- Q.9(b) Use Floyd Warshall's algorithm to find all-pairs-shortest-path in a directed 6
graph with following weight matrix:

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$

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Roll No.....

D-75

B.Tech. Computer Science & Engineering - CYS IV Semester Examinations (Jun 2026)

Computer Organization & Architecture (BT-CYS-210A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Define interrupt.	2
(b) Define fetch cycle.	2
(c) Define register transfer.	2
(d) Define microinstruction.	2
(e) What is parallel processing?	2
(f) Define RAID.	2

UNIT-I

Q.2(a)	Differentiate between RISC and CISC architectures.	6
Q.2(b)	Discuss the importance of Instruction Set Architecture (ISA) in computer organization.	6
Q.3	Explain Booth's multiplication algorithm for signed binary numbers with a process table. Using Booth's algorithm, perform the multiplication of the signed 5-bit binary numbers -7 and +6. Show all steps including initialization, addition/subtraction operations and arithmetic right shifts.	12

UNIT-II

Q.4	Explain instruction pipelining with a neat diagram. Discuss different types of pipeline hazards and techniques to resolve them.	12
Q.5(a)	Explain stack organization and the role of stack pointer.	6
Q.5(b)	Discuss the role of microprogram sequencer in control memory organization.	6

UNIT-III

Q.6	Describe memory hierarchy in computer systems. Explain cache memory organization and different cache mapping techniques.	12
Q.7(a)	Differentiate between Static RAM (SRAM) and Dynamic RAM (DRAM). Explain associative memory with suitable examples.	6
Q.7(b)	Explain asynchronous data transfer using strobe control and handshaking methods. Compare both techniques.	6

UNIT-IV

Q.8	Discuss various modes of data transfer: Programmed I/O, Interrupt-driven I/O. Compare their advantages and disadvantages.	12
Q.9(a)	Explain the working principle of Direct Memory Access (DMA). Discuss the need and advantages of DMA in modern computer systems.	6
Q.9(b)	Discuss the working principle of an Input-Output Processor (IOP) and its advantages over programmed I/O.	6

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