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PART – A (SHORT ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Program Outcome
	UNIT – I		
1	**Define** the term algorithm and state the criteria the algorithm should satisfy.	Knowledge	1
2	**Write** order of an algorithm and the need to analyze the algorithm.	Knowledge	2
3	**Define** asymptotic notations: big 'Oh', omega and theta?	Knowledge	2
4	**List** the two different types of recurrence	Knowledge	4
5	**State** the best case and worst case analysis for linear search	Knowledge	7
6	If $f(n)=5n^2 + 6n + 4$, then **prove** that f(n) is $O(n^2)$	Apply	3
7	**Give** the recurrence equation for the worst case behavior of merge sort.	Knowledge	7
8	**Compute** the average case time complexity of quick sort	Apply	7
9	**Define** algorithm correctness	Knowledge	3
10	**Describe** best case, average case and worst case efficiency of an algorithm?	Understand	3
11	**Explain** the term amortized efficiency	Understand	3

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S. No	Question	Blooms Taxonomy Level	Program Outcome
12	**Define** order of growth	Knowledge	2
13	**How** do you measure the algorithm running time?	Understand	1
14	**Describe** the role of space complexity and time complexity of a program ?	Knowledge	1
15	**Explain** algorithm design technique?	Understand	3
16	**Use** step count method and analyze the time complexity when two n×n matrices are added	Apply	3
17	**What** is meant by divide and conquer? Give the recurrence relation for divide and conquer.	Understand	7
18	**Define** Control Abstraction and write the computing time of divide and conquer.	Knowledge	7
19	**List** out any two drawbacks of binary search algorithm.	Knowledge	7
20	**What** are the drawbacks of Merge Sort algorithm.	Knowledge	7

PART – B (LONGANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Program Outcome
1	**Discuss** various the asymptotic notations used for best case average case and worst case analysis of algorithms.	Understand	1
2	**Differentiate** between priori analysis and posteriori analysis.	Understand	3
3	**Write** binary search algorithm and analyze its time complexity	Understand	7
4	**Explain** quick sort algorithm and simulate it for the following data 20, 35, 10, 16, 54, 21, 25	Apply	7
5	**Discuss** Iterative binary search algorithm	Understand	7
6	**Illustrate** merge sort algorithm and discuss time complexity	Understand	7
7	**Describe** strassen's matrix multiplication.	Understand	7
8	**Explain** amortized analysis	Understand	3
9	**Explain** probabilistic analysis	Understand	3
10	**Sort** the list of numbers using merge sort: 78, 32, 42, 62, 98, 12, 34, 83	Apply	7

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Program Outcome
1	**Solve** the following recurrence relation $T(n) = \{2T\left(\frac{n}{2}\right) + n, \quad and\ T(1) = 2$	Apply	4
2	**Solve** the following recurrence relation $T(n) = 7T(n/2)+cn^2$	Apply	4
3	**Solve** the recurrence relation $T(n) = \begin{cases} k, & n = 1 \\ 3T\left(\frac{n}{2}\right) + kn, & n > 1, \quad n\ is\ power of\ 2 \end{cases}$	Apply	4
4	**Explain** quick sort algorithm and simulate it for following data sequence: 3 5 9 7 1 4 6 8 2	Apply	7
5	**Sort** the list of numbers using merge sort 33, 44, 2, 10, 25, 79, 86, 47, 14, 36	Apply	7
6	**Show** that the average case time complexity of quick sort is O(nlogn)		7

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S. No	Question	Blooms Taxonomy Level	Program Outcome
7	**Apply** merge sort on letters H, K, P,C,S,K,R,A,B,L	Apply	7
8	**Apply** strassen's matrix multiplication on following matrices $\begin{bmatrix} 4 & 5 \\ 5 & 9 \end{bmatrix}, \begin{bmatrix} 2 & 10 \\ 1 & 6 \end{bmatrix}$	Apply	7
9	**Write** and solve recurrence relation for strassen's matrix multiplication	Apply	7
10	**Solve** the following recurrence relation $T(n) = \{2T\left(\frac{n}{2}\right) + 1, \quad and\ T(1) = 2$	Apply	4

UNIT-II

PART – A (SHORT ANSWER QUESTIONS)

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	**Discuss about** union operation on sets	Knowledge	5
2	**Describe** find operation on sets	Knowledge	5
3	**Define** spanning tree and minimal spanning tree	Knowledge	6
4	**What** do mean by depth first search	Knowledge	5
5	**Define** breadth first search	Knowledge	5
6	**Differentiate** Breadth first search and depth first search	Analyze	5
7	**Describe** AND/OR graph	Knowledge	5
8	**Explain** game tree	Understand	5
9	**Define** an articulation point?	Knowledge	5
10	**Define** a connected and bi-connected component.	Knowledge	5

PART – B (LONGANSWER QUESTIONS)

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	**Write an algorithm for** breadth first search . Give example	Understand	5
2	**Explain** depth first search algorithm with example	Understand	5
3	**Discuss** various tree traversal techniques with examples	Understand	5
4	**Compare** and contrast BFS and DFS.	Analyze	5
5	**Explain** in detail about AND/OR graphs	Understand	5
6	**Discuss about** weighting rule for finding UNION of sets and collapsing rule	Understand	5
7	**Differentiate** divide and conquer and greedy method	Understand	6,7
8	**Discuss** game trees	Understand	5

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

1	**Solve** BFS traversal of following graph	Understand	5

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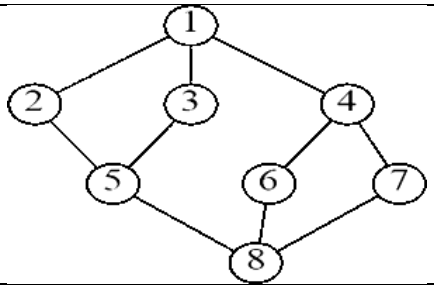
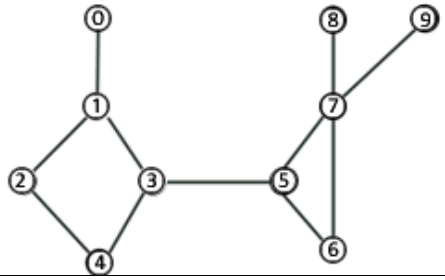
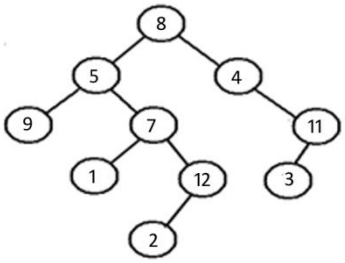
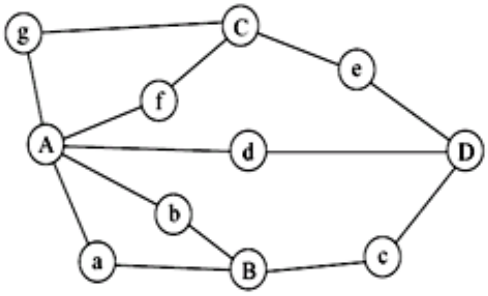
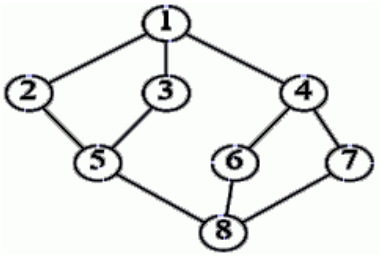
S. No	Question	Blooms Taxonomy Level	Program Outcome
			
2	**List** the articulation points from the following graph 	Understand	5
3	**Write** inorder, preoreder, post order traversal of the following tree 	Understand	5
4	**Apply** DFS and BFS traversals of following graph 	Understand	5
5	**Illustrate** DFS traversal of following graph 	Understand	5
6	**Apply** BFS traversal of following graph	Understand	5

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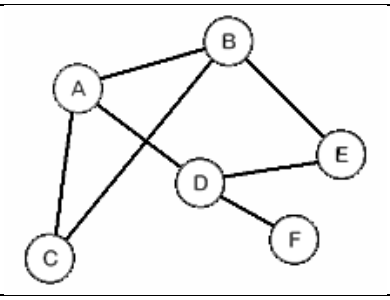
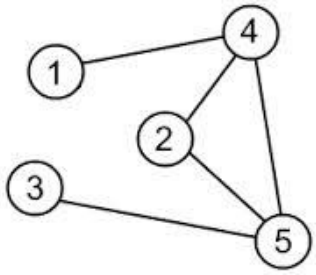
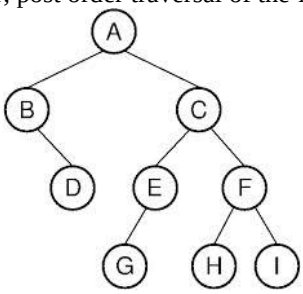
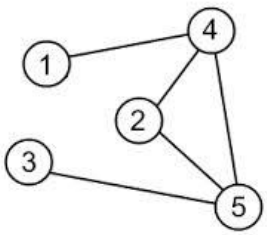
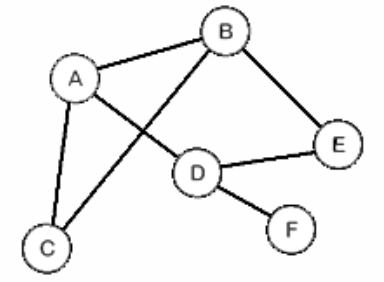
S. No	Question	Blooms Taxonomy Level	Program Outcome
			
7	**List** the articulation points from the following graph 	Understand	5
8	**Write** inorder, preorder, post order traversal of the following tree 	Understand	5
9	**Illustrate** BFS and DFS traversals of following graph 	Understand	5
10	**Apply** DFS traversal of following graph 	Understand	5

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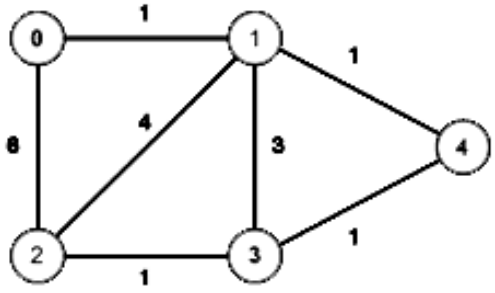
S. No	Question	Blooms Taxonomy Level	Program Outcome
	UNIT-III		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Define** greedy method	Knowledge	8
2	**What** is job sequencing with deadlines problem	Knowledge	8
3	**Define** minimum cost spanning tree	Knowledge	8
4	**State** the principle of optimality	Knowledge	8
5	**State** prims algorithm	Knowledge	8
6	**Explain** kruskals algorithm	Knowledge	8
7	**Define** single source shortest path problem	Knowledge	8
8	**What** is dynamic programming.	Knowledge	8
9	**List** the features of dynamic programming	Understand	8
10	**Distinguish** greedy method and dynamic programming	Analyze	8,9
	PART – B (LONGANSWER QUESTIONS)		
1	**Explain** in detail job sequencing with deadlines problem with an example	Apply	8
2	**Discuss** single source shortest path problem with example	Apply	8
3	**Write** an algorithm knapsack problem .Give example	Apply	8
4	**Explain** prims algorithm with an example	Understand	8
5	**Discuss** kruskals algorithm with an example	Understand	8
6	**Explain** the concept multistage graphs with example.	Apply	8
7	**Write** an algorithm for optimal binary search tree Give example	Apply	8
8	**Explain** 0/1 knapsack problem with example	Understand	8
9	**Discuss** all pairs shortest path problem with an example	Understand	8
10	**Describe** the travelling salesman problem and discuss how to solve it using dynamic programming?	Understand	9
	PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)		
1	**Compute** the optimal solution for job sequencing with deadlines using greedy method. N=4, profits (p1,p2,p3,p4) = (100,10,15,27), Deadlines (d1,d2,d3,d4) = (2,1,2,1)	Apply	8
2	**Compute** the optimal solution for knapsack problem using greedy methodN=3, M= 20, (p1,p2,p3)= (25,24,15), (w1,w2,w3) =(18,15,10)	Apply	8
3	**Construct** minimum cost spanning tree using a) prims algorithm b) kruskal algorithm 	Apply	8

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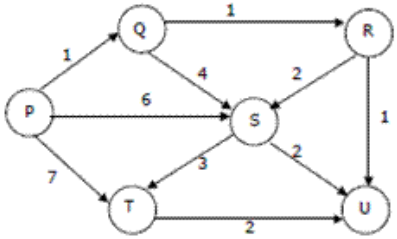
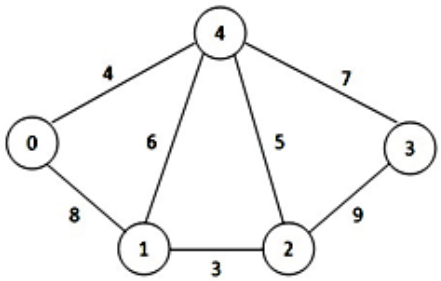
S. No	Question	Blooms Taxonomy Level	Program Outcome
4	**Apply** single source shortest path algorithm for the following graph 	Apply	8
5	**Use** optimal binary search tree algorithm and compute wij, cij, rij, 0<=i<=j<=4,p1=1/10, p2=1/5, p3=1/10, p4=1/120, q0=1/5, q1=1/10, q2=1/5, q3=1/20,q4=1/20.	Apply	8
6	**Construct** optimal binary search for (a1, a2, a3, a4) = (do, if,int, while), p(1 : 4) = (3,3,1,1) q(0 : 4)= (2,3,1,1,1)	Apply	9
7	**Solve** the solution for 0/1 knapsack problem using dynamic programming(p1,p2,p3, p4) = (11, 21, 31, 33), (w1, w2, w3, w4) = (2, 11, 22, 15), M=40, n=4	Apply	9
8	**Solve** the solution for 0/1 knapsack problem using dynamic programming N=3 , m=6 profits (p1,p2,p3) = (1,2,5) weights (w1,w2,w3) = (2,3,4)	Apply	9
9	**Find** the shortest tour of traveling sales person for the following cost matrix using dynamic Programming $\begin{bmatrix} \infty & 12 & 5 & 7 \\ 11 & \infty & 13 & 6 \\ 4 & 9 & \infty & 18 \\ 10 & 3 & 2 & \infty \end{bmatrix}$	Apply	9
10	**Calculate** shortest distances using all pairs shortest path algorithm 	Apply	9
	UNIT-IV		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**State** the principle of Backtracking	Remember	10
2	**Write** control abstraction for backtracking	Apply	10
3	**List** the applications of backtracking?	Remember	10

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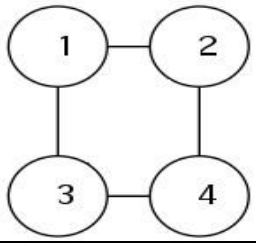
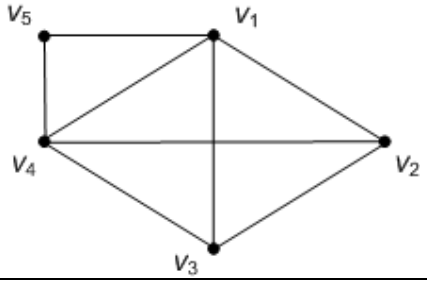
S. No	Question	Blooms Taxonomy Level	Program Outcome
4	**Define** a dead node	Knowledge	10
5	**Differentiate** live node and dead node	Knowledge	10
6	**Define** state space tree	Knowledge	10
7	**What** do mean by solution space	Knowledge	10
8	**Define** solution states and answer state?	Knowledge	10
9	**Explain** 8 – Queens problem	Understand	10
10	**Define** Sum of Subsets problem	Understand	10
PART – B (LONGANSWER QUESTIONS)			
1	**Write** an algorithm for N-queens problem using backtracking	Apply	11
2	**Explain** subset-sum problem and discuss the possible solution strategies using backtracking.	Apply	10
3	**Describe** graph coloring problem and write an algorithm for m-coloring problem	Understand	10
4	**Write** an algorithm for Hamiltonian cycle with an example	Apply	10
5	**Explain** the properties of LC search	Apply	11
6	**Describe** control abstraction for LC Search	Understand	11
7	**Explain** the principle of FIFO branch and bound	Apply	11
8	**Discuss** principle of LIFO branch and bound	Apply	11
9	**Explain** the method of reduction to solve travelling sales person problem using branch and bound	Apply	11
10	**Solve** TSP using branch and bound method with example	Apply	11
PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	**Sketch** the state space tree degenerated by 4 queens problem	Understand	10
2	**Apply** the backtracking algorithm to solve the following instance of the sum of subsets problem S={5,10,12,13,15,18} and d=30	Apply	10
3	**Sketch** the state space tree generated all possible 3-color,4-node graph 	Apply	10
4	**Identify** Hamiltonian cycle from the following graph 	Understand	10
5	**Solve** the following instance of travelling sales person problem using Least Cost Branch Bound	Apply	11

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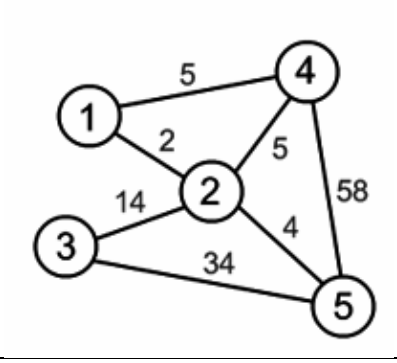
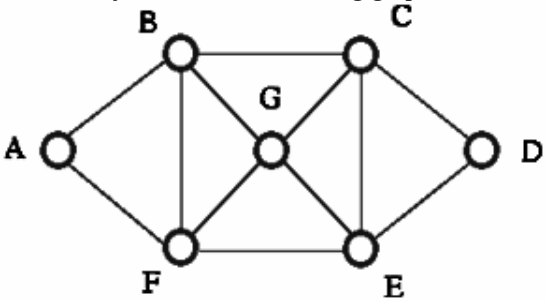
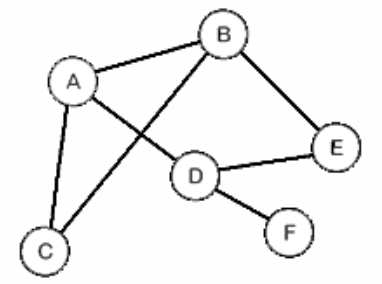
S. No	Question	Blooms Taxonomy Level	Program Outcome
	$\begin{bmatrix} \infty & 12 & 5 & 7 \\ 11 & \infty & 13 & 6 \\ 4 & 9 & \infty & 18 \\ 10 & 3 & 2 & \infty \end{bmatrix}$		
6	**Draw** the portion of state space tree generated by LCBB by the following knapsack problem n=5 , (p1,p2,p3,p4,p5) =(10,15,6, 8, 4), (w1,w2,w3,w4,w5)=(4,6,3,4,2) and m=12	Understand	11
7	**Draw** the portion of state space tree generated by FIFO knapsack for the instance N=4 , (P1, P2, P3, P4)= (10, 10, 12, 18) , (w1, w2,w3,w4) = (2, 4, 6, 9) , m=15	Understand	11
8	**Solve** the following instance of travelling sales person problem using Least Cost Branch Bound 	Apply	11
9	**Identify** Hamiltonian cycle from the following graph 	Understand	10
10	**Apply** the backtracking algorithm to color the following graph 	Understand	10

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UNIT-V			
PART – A (SHORT ANSWER QUESTIONS)			
S. No	**Question**	**Blooms Taxonomy Level**	**Program Outcome**
1	**Define** class P	Knowledge	12
2	**Compare** NP-hard and NP-completeness	Knowledge	12
3	**Define** NP- hard problem	Knowledge	12
4	**What are** NP-complete problem	Knowledge	12
5	**Define** deterministic problem?	Knowledge	12
6	**Define** non-deterministic problem	Knowledge	12
7	**What is** a decision problem?	Knowledge	12
8	**Explain** optimization problem	Understand	12
9	**Define** maxclique problem?	Understand	12
10	**Define** halting problem	Knowledge	12
PART – B(LONG ANSWER QUESTIONS)			
1	**State** and prove cook's theorem	Apply	12
2	**Explain** deterministic and non-deterministic algorithms	Apply	12
3	**Write** non deterministic algorithm for sorting and searching	Understand	12
4	**Discuss about** non-deterministic knapsack algorithm	Apply	12
5	**Explain** how P and NP problems are related	Understand	12
6	**Distinguish** NP- hard and NP-complete problems	Understand	12
7	**Explain** decision problem with an example	Apply	12
8	**What is** chromatic number decision problem and clique decision problem	Apply	12
9	**Explain** the strategy to prove that a problem is NP-hard	Apply	12
10	**Discuss** various intractable problems give examples	Understand	12
PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	**Show** that satisfiability is at most three literals reduces to chromatic number	Understand	12
2	**Prove** Hamiltonian cycle is in NP	Apply	12
3	**Prove** circuit-SAT is in NP	Apply	12
4	**List** two problems that have polynomial time algorithms justify your answer	Understand	12
5	**Explain** 3CNF satisfiability problem	Understand	12
6	**Discuss** P type problems with examples	Understand	12

HOD-CSE

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