Department of IT

B. Tech. Mid Question Bank (R22 Regulation)

Academic Year: 2024-25 Semester:V

Subject Name: Algorithms Design and Analysis

Faculty Name: G.Menaka.

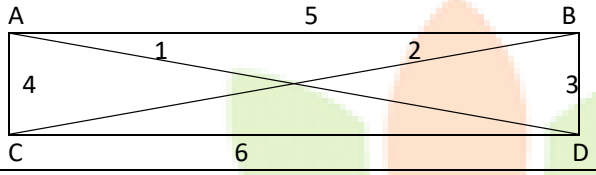
PART-A

MID-I Questions					
Q.No	**Questions**	**Marks**	**BL**	**CO**	**Unit No**
1.	What is an Algorithm?	2M	L1	CO1	1
2.	Describe the properties of an Algorithm.	2M	L1	CO1	1
3.	Define Time Complexity.	2M	L1	CO1	1
4.	Define Space Complexity.	2M	L1	CO1	1
5.	Explain " Divide and Conquer Technique".	2M	L2	CO1	1
6.	What are the applications of divide and conquer method?	2M	L1	CO1	1
7	What is Union and Find?	2M	L1	CO2	2
8	State 8 queen's problem.	2M	L1	CO2	2
9	What is backtracking? what is the advantage of this method?	2M	L1	CO2	2
10	What are different applications of backtracking?	2M	L1	CO2	2
11	Write a short notes on Graph Coloring.	2M	L1	CO2	2
12	What is priority queue?	2M	L1	CO2	2
13	Write the steps involved in typical Dynamic Programming.	2M	L1	CO3	3
14	Explain principal of optimality.	2M	L2	CO3	3
15	What are the applications of dynamic programming?	2M	L1	CO3	3
MID-II Questions					
16	Explain 0/1 knapsack problem.	2M	L2	CO3	3
17	Write an algorithm of all pairs shortest path problem.	2M	L1	CO3	3
18	Differentiate between backtracking and dynamic programming.	2M	L4	CO3	3
19	Define Greedy Knapsack.	2M	L1	CO4	4
20	Explain a) Feasible solution b)Optimal solution	2M	L2	CO4	4
21	What is binary tree? What are three traversals used in traversing binary tree?	2M	L1	CO4	4
22	What is spanning tree? Explain with an example and also give applications of spanning tree.	2M	L1	CO4	4

23	Define the term Connected Components.	2M	L1	CO4	4
24	Explain the concept of articulation point with suitable example.	2M	L2	CO4	4
25	What is a NP Complete problem?	2M	L1	CO5	5
26	Compare NP-hard and NP-Completeness.	2M	L5	CO5	5
27	What is halting problem?	2M	L1	CO5	5
28	Compare backtracking and branch and bound method.	2M	L5	CO5	5
29	Explain the general method of branch and bound.	2M	L2	CO5	5
30	Write a non-deterministic algorithm for searching element.	2M	L1	CO5	5

PART-B

MID-I Questions					
Q.No	**Questions**	**Marks**	**BL**	**CO**	**Unit No**
1.	Define Time and Space Complexity. Explain with examples.	4M	L1	CO1	1
2.	Define Big Oh, Omega and Theta asymptotic notations and discuss their significance.	4M	L1	CO1	1
3.	Write down the properties of Asymptotic notations.	4M	L1	CO1	1
4.	Explain the Control abstraction for Divide and Conquer method.	4M	L2	CO1	1
5.	Write Divide- and-Conquer recursive Merge Sort algorithm and derive the time complexity of this algorithm.	4M	L1	CO1	1
6.	Show how quick sorts the following sequences of keys in ascending order. 50,30,10,90,80,20,40,70	4M	L1	CO1	1
7.	Write recursive and non-recursive algorithm for binary search using divide and conquer method. Determine the time complexity of binary search method.	8M	L1	CO1	1
8.	Write an algorithm for sorting n numbers using quick sort method. Determine its time complexity.	8M	L1	CO1	1
9.	Explain in detail the Strassen's matrix multiplication.	8M	L2	CO1	1
10	Describe find and union operations on sets.	4M	L5	CO2	2
11	Write the recursive backtracking algorithm.	4M	L1	CO2	2
12	Describe the 4-queen's problem using backtracking.	4M	L5	CO2	2
13	Explain Graph Coloring problem in detail.	4M	L2	CO2	2
14	Explain Heap Sort with suitable example.	4M	L2	CO2	2
15	Write an algorithm for Heap Sort.	4M	L1	CO2	2
16	Define Sum of subsets. Solve sum of subsets for n=6,m=30,w[1:6]={5,10,12,13,15,18}.	8M	L1	CO2	2
17	How 8-queen's problem can be solved using backtracking and explain with an example.	8M	L1	CO2	2
18	Define Graph Coloring and write an algorithm to	8M	L1	CO2	2

<table>
<tr><td></td><td>find Hamiltonian Cycles.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>19</td><td>Consider n=4 and (q1,q2,q3,q4)=(do, if, int ,while).The values for P's and q's are given as P(1:4)=(3,3,1,1) and q(0:4)=(2,3,1,1,1).Construct the optimal binary search tree.</td><td>4M</td><td>L5</td><td>CO3</td><td>3</td></tr>
<tr><td>20</td><td>Solve Knapsack instance M=6, and n=3 .Let Pi and Wi are as shown below.
<table>
<tr><td>I</td><td>Pi</td><td>Wi</td></tr>
<tr><td>1</td><td>1</td><td>2</td></tr>
<tr><td>2</td><td>2</td><td>3</td></tr>
<tr><td>3</td><td>5</td><td>4</td></tr>
</table></td><td>4M</td><td>L6</td><td>CO3</td><td>3</td></tr>
<tr><td>21</td><td>Find the shortest path between all pairs of nodes in the following graph.

</td><td>4M</td><td>L1</td><td>CO3</td><td>3</td></tr>
<tr><td colspan="6">MID-II Questions</td></tr>
<tr><td>22</td><td>Describe the Travelling Sales Person problem and discuss how to solve it using dynamic programming.
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>0</td><td>10</td><td>15</td><td>20</td></tr>
<tr><td>5</td><td>0</td><td>9</td><td>10</td></tr>
<tr><td>6</td><td>13</td><td>0</td><td>12</td></tr>
<tr><td>8</td><td>8</td><td>9</td><td>0</td></tr>
</table></td><td>4M</td><td>L3</td><td>CO3</td><td>3</td></tr>
<tr><td>23</td><td>Write an algorithm for Binary search tree.</td><td>4M</td><td>L1</td><td>CO3</td><td>3</td></tr>
<tr><td>24</td><td>Explain Reliability design problem with suitable example.</td><td>4M</td><td>L2</td><td>CO3</td><td>3</td></tr>
<tr><td>25</td><td>Explain Knapsack problem in Greedy Method.</td><td>4M</td><td>L2</td><td>CO4</td><td>4</td></tr>
<tr><td>26</td><td>Write an algorithm for job sequencing with deadlines.</td><td>4M</td><td>L1</td><td>CO4</td><td>4</td></tr>
<tr><td>27</td><td>Obtain the optimal solution for the job sequencing with deadlines when n=5 (p1,p2,p3,p4,p5)=(20,15,10,5,1) and (d1,d2,d3,d4,d5)=(2,2,1,3,3)</td><td>4M</td><td>L2</td><td>CO4</td><td>4</td></tr>
<tr><td>28</td><td>Explain Breadth First Search algorithm with suitable Example.</td><td>4M</td><td>L2</td><td>CO4</td><td>4</td></tr>
<tr><td>29</td><td>Write a short notes on single source shortest path problem?</td><td>4M</td><td>L1</td><td>CO4</td><td>4</td></tr>
<tr><td>30</td><td>Write non-recursive algorithm for in-order, post-order, pre-order.</td><td>4M</td><td>L1</td><td>CO4</td><td>4</td></tr>
<tr><td>31</td><td>Consider that there are three items. weight and profit value of each item is as given below. Also W=20.Obtain the solution for the above given Knapsack problem
<table>
<tr><td>I</td><td>Wi</td><td>Pi</td></tr>
<tr><td>1</td><td>18</td><td>30</td></tr>
<tr><td>2</td><td>15</td><td>21</td></tr>
</table></td><td>8M</td><td>L2</td><td>CO4</td><td>4</td></tr>
</table>

	3 | 10 | 18				
32	Explain the Prim's algorithm with the appropriate example.	8M	L2	CO4	4
33	Explain the Kruskal's algorithm with the appropriate example.	8M	L2	CO4	4
34	Differentiate between P class and NP class problems.	4M	L6	CO5	5
35	Write a non-deterministic knapsack algorithm.	4M	L1	CO5	5
36	Write a brief note on P,NP,NP hard and NP complete.	4M	L1	CO5	5
37	Explain the principles of FIFO branch and bound.	4M	L2	CO5	5
38	Differentiate between Dynamic Knapsack and branch and bound knapsack problem.	4M	L6	CO5	5
39	Explain about cook's theorem.	4M	L2	CO5	5
40	The edge length of a directed graph are given by the below matrix using the travelling salesperson algorithm, calculate the optimal tour. @ 20 30 10 11 15 @ 16 4 2 3 5 @ 2 4 19 6 18 @ 3 16 4 7 16 @ @=Infinity	8M	L2	CO5	5
41	Explain LC -Branch and bound solution. consider knapsack instance n=4 with capacity m=15 such that Object i: Pi: Wi 1: 10: 2 2: 10: 4 3: 12: 6 4: 18: 9	8M	L2	CO5	5
42	Explain FIFO Branch and bound solution. consider knapsack instance n=4 with capacity m=15 such that Object i: Pi: Wi 1: 10: 2 2: 10: 4 3: 12: 6 4: 18: 9	8M	L2	CO5	5