Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

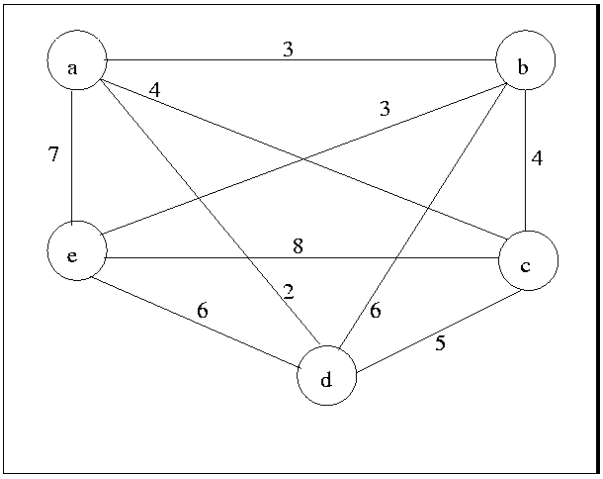
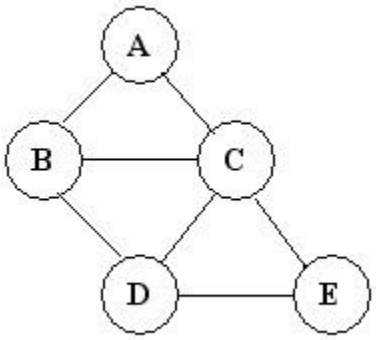
Programme Name: B.Tech(CSE-All Courses + B.Tech(CSE+CL)) **Semester : III**
Course Name : Design and Analysis of Algorithms **Time : 03 hrs**
Course Code : CSEG2003 **Max. Marks : 100**
Nos. of page(s) : 03
Instructions: **Answer the following questions**

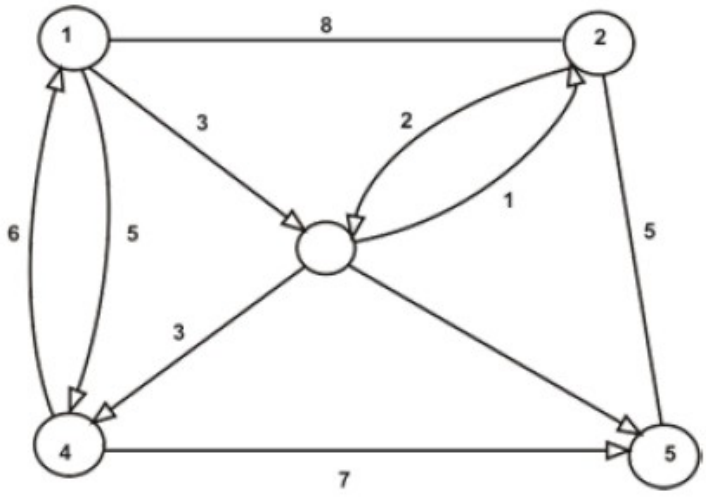
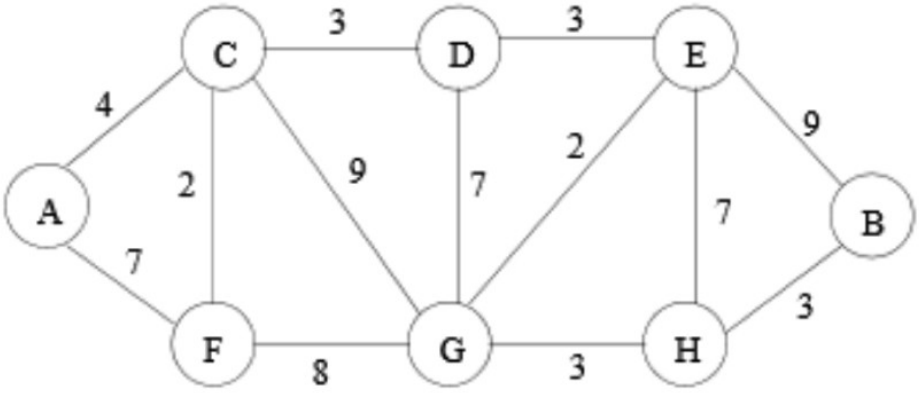
SECTION A

S. No.		Marks	CO
Q1	What is pseudo-code? Explain with an examples	5	CO1
Q2	Differentiate between divide and conquer and dynamic programming.	5	CO1
Q3	Find optimal solution for the knapsack instance using dynamic programming method; n =3,w=[20,15,15],P =[40,25,25] and C =30	5	CO2
Q4	Write down the quicksort worst case, best case, and average case recurrence relations and give one input sequence for each case.	5	CO4

SECTION B

Q5	Write a pseudocode for divide and conquer algorithm for merging two sorted arrays into a single sorted one. Explain with an example.	10	CO1
Q6	Draw an Optimal Binary Search Tree for n=4 identifiers (a1,a2,a3,a4) = (do,if, read, while) and frequencies are P(1:4)=(4,6,7,8)	10	CO2
Q7	Find the Optimal Solution for Travelling Sales Person problem using Branch and Bound designing technique.	10	CO4

			
Q8	Apply the chained matrix multiplication algorithm to find the minimum number of scalar multiplication operations to multiply the following matrix sizes; M1= (4x10), M2=(10x3), M3= (3x12), M4= (12x20) and M5= (20x7). OR Write an algorithm to find the BFS traversing order and construct the DFS and BFS tree for the following graph. 	**10**	**CO3**
	SECTION-C		
Q9	a). Give the statement of sum –of subsets problem. Find all sum of subsets for n=4, (w1, w2, w3, w4) = (11, 13, 24, 7) and M=31.Draw the portion of the state space tree b). Devise an algorithm to find the shortest path using all pair shortest path algorithm. Find the shortest path for the following graph using Floyd's algorithm.	**10+10 = 20**	**CO3, CO2**

			
Q10	a). Design a recursive algorithm to solve the Tower of Hanoi problem and Derive the time complexity of tower of Hanoi problem. b). Design an algorithm for single source shortest path algorithm and Apply the Dijkstra's algorithm to find the shortest path for the following graph start with node 'A'.  **OR** c). Define backtracking? Draw the solution state space tree for the 8-Queens problem. d). Design a Prim's algorithm to find the minimum cost spanning tree and explain with an example	**10+10 = 20**	**CO4, CO5**

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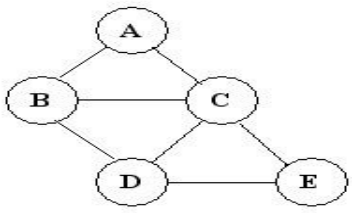
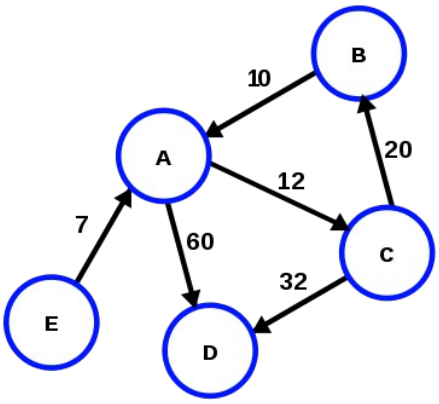
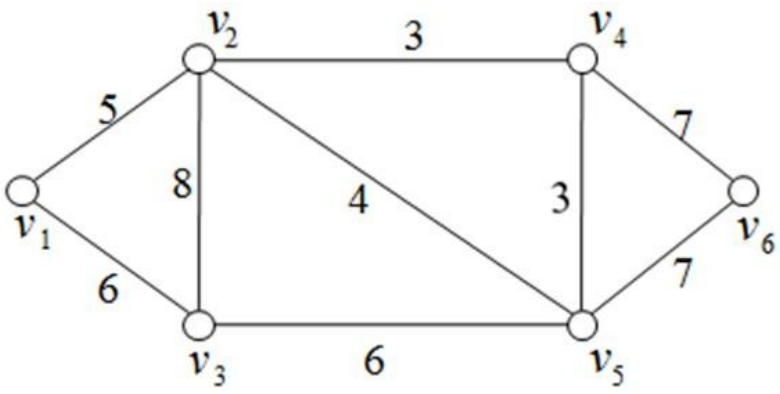
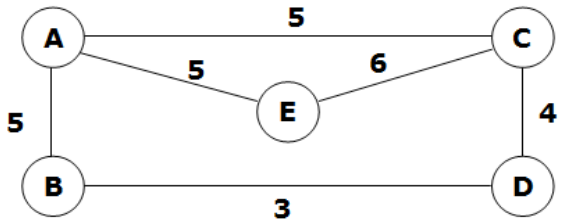
Instructions: **Answer the following questions**

SECTION A

S. No.		Marks	CO
Q1	Derive the time complexity of recursive merge sort.	5	CO1
Q2	Construct the spanning tree for the following graph using BFS and DFS method. 	5	CO1
Q3	Define the following with an example; i) Feasible solution ii) Optimal solution	5	CO2
Q4	What is dynamic programming? Design an algorithm to solve the 0/1 knapsack problem using Dynamic programming.	5	CO4

<table>
<tr><td colspan="4">SECTION B</td></tr>
<tr><td>Q5</td><td>Apply quicksort to sort the list E, X, A, M, P, L, E in alphabetical order and draw the recursive call binary tree.</td><td>10</td><td>CO1</td></tr>
<tr><td>Q6</td><td>Explain the general principle of the Greedy method and Find the optimal profit and the optimal solution for the following instance of the Knapsack problem using the greedy technique.
<table><tr><td>Object</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Profit</td><td>10</td><td>40</td><td>30</td><td>50</td></tr><tr><td>Weight</td><td>5</td><td>4</td><td>6</td><td>3</td></tr></table>Maximum Knapsack capacity = 12</td><td>10</td><td>CO2</td></tr>
<tr><td>Q7</td><td>Explain N-sequence problem with an algorithm. Find the optimal solutions to solve the 8-queens problem using backtracking.</td><td>10</td><td>CO4</td></tr>
<tr><td>Q8</td><td>Construct the optimal binary search tree for the following data using Dynamic programming technique.
<table><tr><td>Element</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>Data</td><td>10</td><td>12</td><td>16</td><td>21</td></tr><tr><td>Frequency</td><td>4</td><td>2</td><td>6</td><td>3</td></tr></table>OR
Devise an algorithm to solve the single source shortest path problem and find the shortest path from node A to all the remaining nodes.
  </td><td>10</td><td>CO3</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q9</td><td>a). Devise an algorithm to implement binary search and explain with an example.
b). Design an algorithm for the sum of subset problem using backtracking. Also solve the following instance of sum of subset problem : S ={1,5,2,7} with d = 8.</td><td>10+10 =20</td><td>CO3, CO2</td></tr>
<tr><td>Q10</td><td>a). Apply Branch and Bound algorithm to solve the traveling salesman problem for</td><td>10+10</td><td>CO4,</td></tr>
</table>

	the following graph with start node v1.  b). Explain the dynamic programming with Floyd's algorithm in detail. Apply Floyd's algorithm to find the shortest path for the following graph.  OR c). Construct a Huffman code for the following data and also calculate the compression ratio. Character : A , B , C, D , - Probability: 0.4 , 0.1, 0.2, 0.15, 0.15 d). Design an algorithm for binary search and derive it's time complexity.	**=20**	**CO5**