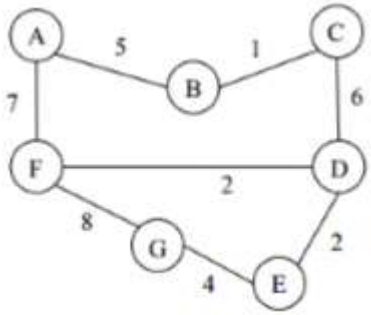
Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Algorithm Design and Analysis — **Semester: I**
Program: M.Tech (CSE) — **Time 03 hrs.**
Course Code: CSEG 7001 — **Max. Marks: 100**

Instructions:

SECTION A
(All Questions Compulsory, Each Question Carries 4 Marks)

S. No.		Marks	CO
Q 1	How do you justify that divide and conquer algorithms take less time complexity in comparison with brute force algorithms.	**4**	**CO1**
Q2	How will you handle if the problem comprises of overlapping sub-problems?	**4**	**CO3**
Q3	Compute the MST using Prim's algorithm for the following graph 	**4**	**CO2**
Q4	Explain time-space trade off and growth functions.	**4**	**CO1**
Q5	Discuss any two problems where approximation algorithms are needed	**4**	**CO4**

SECTION B
(All Questions Compulsory, Each Question Carries 10 Marks)

Q 6	Solve the following recurrence relations using recursion tree method a) $T(n)=2T(n/2)+n^2$ b) $T(n)=T(n/2)+n$	**10**	**CO1**
Q 7	Devise an algorithm and explain to determine bi-connected Components. Prove the theorem that two bi-connected components can have at most one vertex as common and this vertex is an articulation point.	**10**	**CO2, CO3**

<table>
<tr><td>Q 8</td><td>Consider the following items with their weights and profits and knapsack capacity as 5. Apply the Greedy strategy to fill the knapsack with maximum benefit,

<table><tr><th>Item</th><th>Weight</th><th>Profit</th></tr><tr><td>1</td><td>2</td><td>30</td></tr><tr><td>2</td><td>10</td><td>20</td></tr><tr><td>3</td><td>6</td><td>18</td></tr><tr><td>4</td><td>8</td><td>10</td></tr></table></td><td>10</td><td>CO3, CO2</td></tr>
<tr><td>Q 9</td><td>Draw the state space tree for 4 queen’s problem
(OR)
Consider the travelling salesperson problem given by following cost matrix
$\begin{bmatrix} 0 & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$
Obtain the optimum tour using dynamic reduction method. Draw a portion of state space tree using LCBB.</td><td>10</td><td>CO4</td></tr>
<tr><td colspan="4">SECTION-C
(All Questions Compulsory, Each Question Carries 20 Marks)</td></tr>
<tr><td>Q 10</td><td>Find an optimal parenthesization of a matrix-chain product for 4X10, 10X3, 3X12, 12X20 and 20X7. Justify dynamic programming solution takes less time complexity for this problem in comparison to brute force approach.</td><td>20</td><td>CO2, CO3</td></tr>
<tr><td>Q 11</td><td>Let m=31 and w= {7,11,13,24} draw a portions of state space tree using algorithm sum_subset(). Clearly show the solutions obtained.

(OR)

Let T be a text of length n, and let P be a pattern of length m. Describe an O(n+m) time method for finding the longest prefix of P that is a substring of T.</td><td>20</td><td>CO2, CO3</td></tr>
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