Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Design and Analysis of Algorithms **Semester: V**

Programme: B.Tech Mechatronics

Time: 03 hrs. **Max. Marks: 100**

Instructions: All questions are compulsory. Internal choices in Q9 & Q10

SECTION A

S. No.		Marks	CO
Q 1	Compare and contrast between Greedy Approach and Dynamic Programming.	4	CO3
Q 2	In how many passes does the Quick sort technique sorts the following sequence 3,27,4,11,45,39,2,16,56 ?	4	CO2
Q 3	Write the Binary search algorithm and analyze for its best, worst and average case time complexity.	4	CO2
Q 4	Solve the following recurrence relation using Masters Theorem: $T(n) = 2T(n/2) + n \log n$	4	CO1

Q 5	What is the time complexity of following function fun ()? Explain
	`int fun(int n)`
	`{`
	`for (int i = 1; i <= n; i++)`
	`{`
	`for (int j = 1; j < n; j += i)`
	`{`
	`Sum = Sum +i*j;`
	`}`
	`}`
	`return(Sum);`
	`}`
		4	CO1

SECTION B

Q 6	What is Job Sequencing with deadline problem? Consider the following 5 jobs with their respective deadline and profit. Job- {j2, j1, j4, j3, j5} Deadline- {1, 2, 2, 3, 1} Profit- {100, 60, 40, 20, 20}. Solve the problem to earn maximum profit when only one job can be scheduled or processed at any given time.	10	CO3
Q 7	Compare and Contrast between Breadth First Search and Depth First Search with an appropriate example and also explain its various applications.	10	CO4
Q 8	Differentiate between Prims and Kruskals algorithms for Minimum Cost Spanning Tree and solve the given graph using Kruskal Algorithm:	10	CO3

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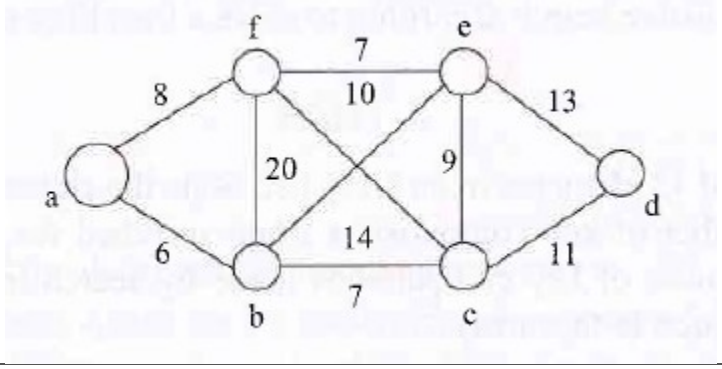
<tr><td></td><td> 
</td><td></td><td></td></tr>
<tr><td>Q 9</td><td>Write down the algorithm for Merge Sort and derive the worst-case time complexity of it by writing the recurrence relation.

OR

Write down the algorithm for Quick Sort and derive the worst-case time complexity of it by writing the recurrence relation.</td><td>10</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q 10</td><td>Describe the Dynamic 0/1 Knapsack Problem. Write down the algorithm and also find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3) = (1,2,5), weights are (w1,w2,w3)=(2,3,4).

OR

What is Travelling Salesperson Problem, write down the algorithm and Construct an optimal travelling sales person tour using Dynamic Programming.
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>A</td><td>0</td><td>10</td><td>9</td><td>3</td></tr>
<tr><td>B</td><td>5</td><td>0</td><td>6</td><td>2</td></tr>
<tr><td>C</td><td>9</td><td>6</td><td>0</td><td>7</td></tr>
<tr><td>D</td><td>7</td><td>3</td><td>5</td><td>0</td></tr>
</table></td><td>20</td><td>CO3</td></tr>
<tr><td>Q 11</td><td>a) Differentiate between Branch and Bound and Backtracking approach with suitable example. [8]
b) State 8 Queens Problem and write down the algorithm for the same with proper example. [12]</td><td>20</td><td>CO5</td></tr>
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Instructions: All questions are compulsory. Internal choices in Q9 & Q10

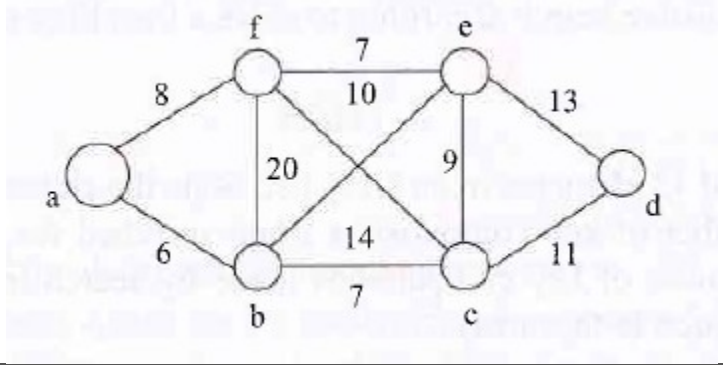
SECTION A

S. No.		Marks	CO
Q 1	Compare and contrast between Greedy Approach and Divide and Conquer.	**4**	**CO3**
Q 2	In how many passes does the Merge sort technique sorts the following sequence 3,27,4,11,45,39,2,16,56?	**4**	**CO2**
Q 3	Write an algorithm to find the maximum or minimum element in a given array and analyze for its best, worst and average case time complexity.	**4**	**CO2**
Q 4	Solve the following recurrence relation using Masters Theorem: $T(n) = 16T(n/4) + n$	**4**	**CO1**

Q 5	What is the time complexity of following function fun ()? Explain
	`int fun(int n)`
	`{`
	`for (int i = 1; i <= n; i++)`
	`{`
	`for (int j = 1; j < n; j += i)`
	`{`
	`Sum = Sum +i*j;`
	`}`
	`}`
	`return(Sum);`
	`}`
		4	**CO1**

SECTION B

Q 6	What is Job Sequencing with deadline problem? Consider the following 5 jobs with their respective deadline and profit. Job- {j2, j1, j4, j3, j5} Deadline- {1, 2, 2, 3, 1} Profit- {100, 60, 40, 20, 20}. Solve the problem to earn maximum profit when only one job can be scheduled or processed at any given time.	**10**	**CO3**
Q 7	Compare and Contrast between Breadth First Search and Depth First Search with an appropriate example and also explain its various applications.	**10**	**CO4**
Q 8	Differentiate between Prims and Kruskals algorithms for Minimum Cost Spanning Tree and solve the given graph using Kruskal Algorithm:	**10**	**CO3**

			
Q 9	Write down the algorithm for Merge Sort and also derive the worst case time complexity of it by writing the recurrence relation. OR Write down the algorithm for Quick Sort and also derive the worst case time complexity of it by writing the recurrence relation.	**10**	**CO2**
	SECTION-C		
Q 10	Find an optimal solution to the fractional knapsack instance n=7 objects and the capacity of knapsack m=15. The profits and weights of the objects are (P1,P2,P3, P4, P5, P6, P7)= (10, 5,15,7,6,18,3) (W1,W2,W3,W4,W5,W6,W7)= (2,3,5,7,1,4,1) OR What is Sum of Subset Problem using Backtracking? Suppose there is a set of elements w = { 5,7,10,12,15,18,20} and m = 35. Find out the all-possible sum of subsets.	**20**	**CO3**
Q 11	a) What is Graph coloring Problem? Explain with help of an example. [8] b) State 8 Queens Problem and write down the algorithm for the same with proper example. [12]	**20**	**CO5**