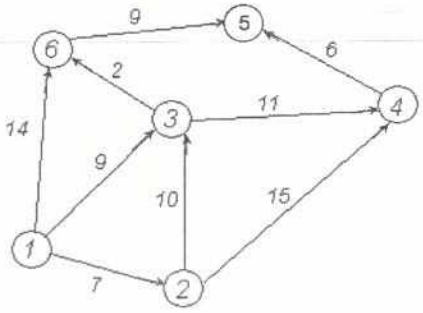
Roll Number:_____

Thapar University, Patiala

Department of Computer Science and Engineering

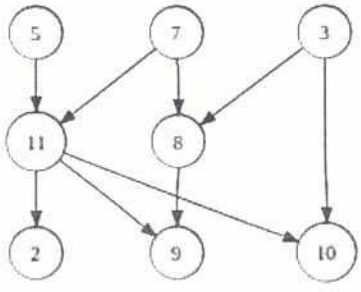
EST	Course Code: UCS406
B. E. COE, CML,CAG,SEM (Second Year): Semester-IV	Course Name : Data Structures and Algorithms
May 19, 2016	Thursday, 9.00 – 12.00 Hrs
Time: 3 Hours, M. Marks: 100	Name of Faculty: DG, RIR, TBH, ANK

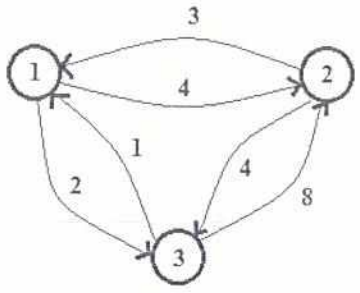
Note: ***All questions are compulsory and attempt all parts of a question at one place.***
Assume missing data, if any, suitably. Clearly specify your notations used in algorithms.

Q 1. a)	**Write algorithm for matrix-chain product problem using dynamic programming.** Apply the same to find an optimal parenthesization of given 5 matrices whose sequence of dimensions is <4,10,3,12,20,7> i.e $A_1(4x10)$, $A_2(10x3)$, $A_3(3x12)$, $A_4(12x20)$ and $A_5(20x7)$.	(14)
b)	**Apply Dijkstra's algorithm** on the following directed weighted graph. Find out the minimum cost from given **source 1** to all the possible destinations. 	(6)
Q 2. a)	**Write algorithm for 0-1 knapsack problem using dynamic programming**. Apply the same **to find optimal items** in the Knapsack in the following example and show all the intermediate steps. Consider 4 items along their respective weights and values	(14)

Item i	Value v_i	Weight w_i
1	15	1
2	10	5
3	9	3
4	5	4

The maximum capacity of the knapsack is **W = 8.** Fill the knapsack such that knapsack should not exceed its maximum capacity and it should have maximum profit value.

b)	Arrange the nodes of the following Directed Acyclic Graph using **Topological Sort**. 	(6)

Q 3. a)	**Write algorithm for n queen problem using backtracking approach**. Discuss your algorithm step wise for a 4x4 chess board.	(14)
b)	Find the complexity of the following: **1.** $T(n) = 4T(n/2) + \log n$ **2.** $T(n) = 3T(n/3) + n/2$ **3.** $T(n) = 3T(n/4) + n \log n$	(6)
Q 4. a)	**Define the TSP problem.** Find the minimum cost tour in the following graph using **Branch and Bound approach.**  	(10)
b)	Considering inserting the keys 20 32 41 14 25 38 27 98 69 into a hash table of length m =11 using open addressing with the primary hash function h(k) = k mod m. Illustrate the result of inserting these keys using linear probing, using quadratic probing and using double hashing with $h'(k) = 1 + (k \bmod (m-1))$.	(10)
Q 5. a)	Compare P, NP and NP-complete.	(20)
b)	Differentiate among Divide and conquer, Dynamic Programming and backtracking.	
c)	Define Queue and its possible operations.	
d)	Differentiate between BFS and DFS.	
e)	Discuss memory representations of a graph with suitable example.	