P E S UNIVERSITY, BANGALORE

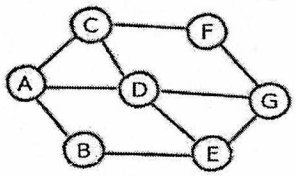
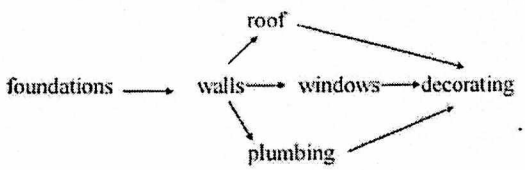
B.Tech .. 4th Semester - Summer Term July 2016

End Semester Assessment

UE14CS251 : Design and Analysis of Algorithms

Time: 3 Hrs	Answer all the questions	Max Marks: 100

1	a	Compare the orders of growth of the following pairs of functions using limits and specify the rate of growth of the first function with respect to the rate of growth of the second function. a) $3n^2$ and $n^2 + 5$ b) $8n^2$ and n^3 Also specify what it means if the limit of the ratio of rate of growth of functions is zero, a constant and infinity.	6M
	b	Explain the concept of O - notation. When is a function t(n) said to be in O(g(n))? Which of the following functions are in $O(n^2)$? $198n, 24n^2, 63n^3, 24n + 98n^2$	3M
	c	Write a brute-force algorithm to determine the largest number in a given list of numbers. Specify its basic operation, determine the number of times the basic operation is executed and also write the efficiency class to which it belongs.	8M
	d	Define an algorithm and name any two algorithm design techniques.	3M
2	a	What is the worst - case efficiency of Bubble Sort? Write the pseudo - code of Bubble Sort algorithm which checks if there were any exchanges made on a pass and if no, stops the algorithm. What does it imply if bubble sort makes no exchanges on a pass?	5M
	b	State the Master Theorem and solve the following recurrence using Master Theorem: $T(n) = 4T(n/2) + n^3$	5M
	c	Explain the Travelling Salesman Problem and the Job Assignment Problem.	4M
	d	Write the Selection Sort algorithm. Specify the efficiency class to which it belongs and sort the following list using Selection Sort. (Use alphabetical order). Python Java Ruby Perl JavaScript	6M

3	a	Consider the following graph:  Traverse the above graph by Depth First Search. Start the traversal at vertex 'A' and resolve the ties at the vertex in alphabetical order. Write the differences between DFS and BFS.	5M
	b	Write the bottom-up heap construction algorithm.	6M
	c	Can Topological Sorting be applied to a digraph which is cyclic? Apply the Source Removal Algorithm for Topological Sorting on the following graph and write all possible solutions that can be obtained.  	4M
	d	List the three variations of the Transform and Conquer Algorithm Design Strategy and give an example for each. Write algorithms to solve Element Uniqueness Problem using Presorting.	5M
4	a	Construct Bad Symbol Shift Table and Good Suffix Shift Table used in Boyer-Moore algorithm for the pattern EXAMPLE in the text HERE_IS_A_SIMPLE_EXAMPLE.	7M
	b	Write an algorithm to determine the transitive closure of a directed graph.	5M
	c	Explain the concept of dynamic programming.	3M
	d	Write Kruskal's algorithm for constructing a minimum spanning tree.	5M
5	a	Define the following: i) Tractable and Intractable Problems ii) Class P and an example iii) Class NP and an example iv) Polynomial Time Reducibility v) NP Complete.	10M
	b	Draw the state space tree for n - Queens problem when n = 4 and explain the concept of backtracking.	10M