USN | | | | | | | | | | | | CS43

Fourth Semester B.E. Degree Examination, June/July 2011
Analysis and Design of Algorithms

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions.*
2. *Algorithms should include sufficient comments.*

1 a. Write Euclid's algorithm to find GCD of two numbers. Derive the complexity of the algorithm. Estimate how many times faster it will be to find GCD (9, 7) by Euclid's algorithm compared with the algorithm based on checking consecutive integers from min(m, n) down to GCD(m, n).   **(12 Marks)**

   b. Explain different ways of representing graphs. Discuss the space and time complexities of those representations.   **(08 Marks)**

2 a. What is the need for analyzing space and time complexity of algorithms? Briefly explain different complexities and various notations used to represent them.   **(12 Marks)**

   b. Write sequential search algorithm. Derive its best, worst, average case efficiencies. **(08 Marks)**

3 a. Write pseudo code of Brute force string matching that returns starting position of pattern string in text string of successful and −1 otherwise.   **(06 Marks)**

   b. State quick sort algorithm. Derive its time complexity. Sort the following dataset using quick sort algorithm :

   9   7   8   1   2.   **(14 Marks)**

4 a. Suggest pseudo code for breadth first search and derive its time complexity. Using same write breadth first search tree for following graph, Fig.Q4(a).
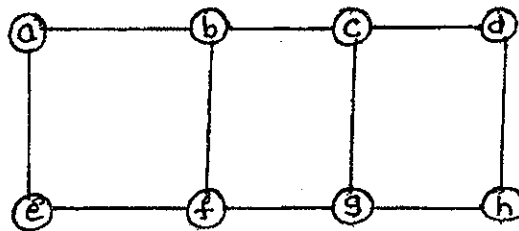

Fig.Q4(a)   **(08 Marks)**

   b. Write an algorithm to topologically sort a diagraph and derive the complexity. Apply same algorithm to digraph, Fig.Q4(b) given below. Show on iteration which vertex is removed.
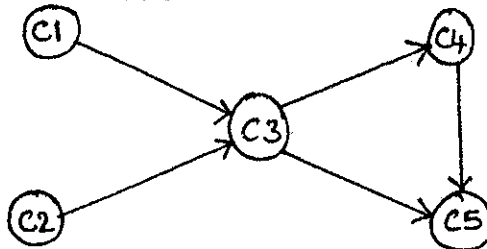

Fig.Q4(b)   **(12 Marks)**

5 a. Write an algorithm for bottom up heap construction and derive its complexity. Explain bottom up heap construction for following list :

   2, 9, 7, 6, 5, 8   **(12 Marks)**

   b. What is an AVL tree? Explain briefly different rotations of AVL tree. Explain construction of AVL tree by successive insertions.   **(08 Marks)**

6 a. Apply Horspool's algorithm to search for pattern democratic in text string :

   INDIA_IS_DEMOCRATIC_COUNTRY   **(06 Marks)**

   b. Compute binomial coefficient $C(6, 3)$ by applying dynamic programming algorithm.

                                                                                        (04 Marks)

   c. Give an algorithm to find all pair shortest path for given weighted graph. Derive the complexity. Illustrate the same with an example.   **(10 Marks)**

7 a. Briefly explain "Greedy strategy".   **(04 Marks)**

   b. Write Prim's algorithm to find minimum spanning tree and derive its time complexity. Compare Prim's strategy with Kruskal's method.   **(12 Marks)**

   c. Using Kruskal's method find minimum spanning tree for following graph, Fig.Q7(c):
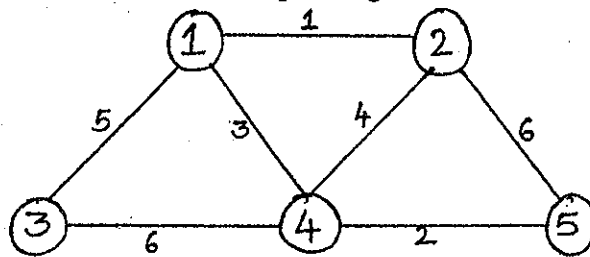

Fig.Q7(c)   **(04 Marks)**

8 a. What is backtracking? With relevant diagrams illustrate the application of backtracking to solve four queen's problem.   **(07 Marks)**

   b. Explain concept of decision trees for searching a sorted array of four elements. **(05 Marks)**

   c. If $P \neq NP$, prove that there exists no C-approximation algorithm for traveling salesman problem.   **(08 Marks)**

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