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10MCA44

**Fourth Semester MCA Degree Examination, June/July 2017**  
**Design and Analysis of Algorithms**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions.**

1. a. Order the following functions according to their order of growth [from the lowest to the highest]:  
 $(n-2)!$ ,  $\log n$ ,  $2n^3$ ,  $2^n$ ,  $n \log n$ ,  $n^2$ ,  $100n$  (04 Marks)
  - b. Write the general plan for analyzing the efficiency of non-recursive algorithms. Explain with an example. (08 Marks)
  - c. Write the brute force string matching algorithm and analyse it for best, worst and average cases. (08 Marks)
  
2. a. Find the order of growth for solution of the following recurrence equation :  
 $T(n) = 4T(n/2) + n$ ,  $T(1) = 1$  (04 Marks)
  - b. Write an algorithm for recursive binary search. (06 Marks)
  - c. Write and explain the Quick sort algorithm using divide and conquer method. Trace the above algorithm for the following input:  
'E', 'X', 'A', 'M', 'P', 'L', 'E' (10 Marks)
  
3. a. Find all possible feasible solutions and the optimal solution generated by Greedy Job sequencing with deadlines procedure, when  $n = 5$   
 $(P_1, P_2, P_3, P_4, P_5) = (3, 5, 20, 6, 30)$   
and  $(d_1, d_2, d_3, d_4, d_5) = (1, 3, 4, 1, 2)$   
Here  $P_i \rightarrow$  indicates profit obtained for job  $i$   
and  $d_i \rightarrow$  indicates the deadline for job  $i$  (10 Marks)
  - b. Apply Kruskal's algorithm to obtain the minimum cost spanning tree for the following graph Fig.Q3(b). [Show different stages of the graph]. (10 Marks)

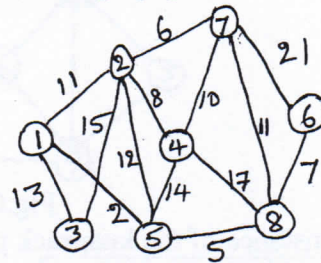


Fig.Q3(b)

4. a. Apply Floyd's algorithm to find all pair shorter paths for the following graph [Fig.Q4(a)].

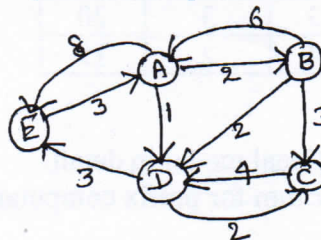


Fig.Q4(a)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

b. Solve the travelling salesman problem for a digraph whose cost matrix is as follows:

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

Fig.Q4(b)

(10 Marks)

5 a. Write an algorithm for insertion sort and analyse it for best, worst and average cases.

(10 Marks)

b. What is topological sorting? Topological sort the following graph ( Fig.Q5(b) ) using DFS algorithm and source removal algorithm.

(10 Marks)

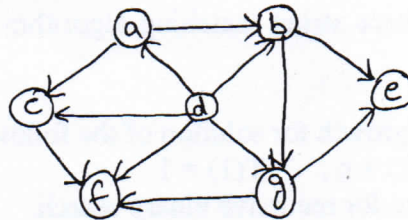


Fig.Q5(b)

6 a. What is input enhancement? Give a linear sorting algorithm which uses this technique and trace it for the following input:

8	6	7	8	7	7
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(10 Marks)

b. Draw a decision-tree to sort 3 elements by selection sort.

(04 Marks)

c. Define P, NP and NP-complete problems.

(06 Marks)

7 a. What is Hamiltonian circuit? Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph Fig.Q7(a). Draw the state space tree.

(10 Marks)

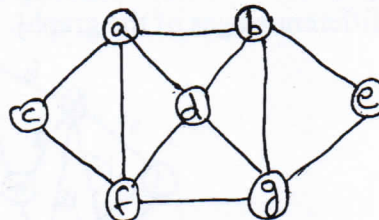


Fig.Q7(a)

b. Solve the following instance of the knapsack problem using branch-and-bound technique.

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	15

$W = 5$

(10 Marks)

8 a. Explain the computational model in detail.

(10 Marks)

b. Explain parallel algorithm for prefix computation and list ranking.

(10 Marks)