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13MCA41

**Fourth Semester MCA Degree Examination, Dec.2015/Jan.2016**

**Analysis and Design of Algorithm**

Time: 3 hrs.

Max. Marks:100

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

- 1 a. Define the following asymptotic notations  
 i) Big oh ii) Big omega iii) Big Theta (06 Marks)  
 b. Prove the following theorem :  
 If  $t_1(n) \in O(g_1(n))$  and  $t_2(n) \in O(g_2(n))$   
 then  $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$  (06 Marks)  
 c. Explain the Tower of Hanoi Puzzle. (08 Marks)
- 2 a. Write an algorithm for selection sort. Trace and analyze the same for the following list :  
 87 45 68 90 29 34 17. (10 Marks)  
 b. Explain the brute force string matching algorithm with an example. (10 Marks)
- 3 a. Write an algorithm for quick sort and analyze its efficiency. (10 Marks)  
 b. Discuss Strassen's matrix multiplication. (10 Marks)
- 4 a. Give the Pseudo code for insertion sort algorithm. (05 Marks)  
 b. Write an algorithm to implement Breath - First search traversal of a graph. Compare D.F.S and B. F.S. (10 Marks)  
 c. Illustrate the source removal algorithm for the topological sorting problem with suitable example. (05 Marks)
- 5 a. Write an algorithm for comparison counting sort. (05 Marks)  
 b. Give the Pseudocode of Horspool's algorithm. (07 Marks)  
 c. Discuss about the two principal versions of hashing. (08 Marks)
- 6 a. Write Warshall's algorithm for computing transitive closure. Apply the algorithm for the following digraph. (10 Marks)

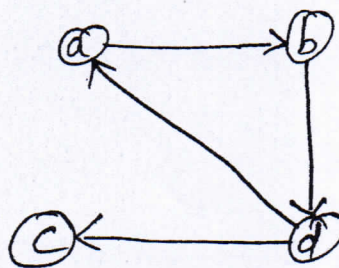


Fig. Q6(a)

- b. Discuss the Knapsack problem by dynamic programming with respect to the following example.

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

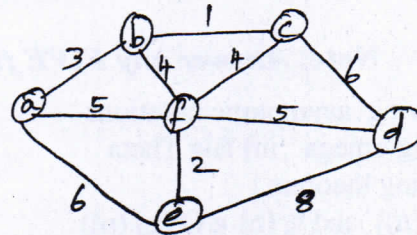
Capacity  $W = 5$

(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.

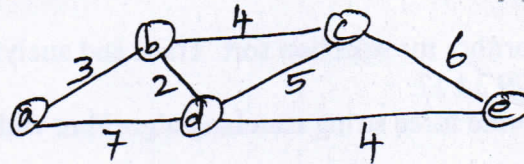
- 7 a. Give the Pseudocode of Prim's algorithm. Apply the algorithm to the following graph to construct minimum spanning tree (10 Marks)

Fig. Q7(a)



- b. Write an algorithm for single – source shortest paths. Apply the algorithm to the following graph to find the shortest paths. (10 Marks)

Fig. Q7(b)



- 8 Discuss the following :
- Four Queens problem
  - Hamiltonian circuit problem
  - P and NP problems
  - NP – Complete problems.

(20 Marks)

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