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15CS43

## Fourth Semester B.E. Degree Examination, June/July 2018

### Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing  
ONE full question from each module.**

#### Module-1

- 1 a. Write an algorithm to find the maximum element in an array of n element. Give the mathematical analysis of this non-recursive algorithm. (06 Marks)
- b. Explain the asymptotic notations BigO, BigΩ and big theta used to compare orders of growth of an algorithm. (06 Marks)
- c. Explain with an example how a new variable count introduced in a program can be used to find the number of steps needed by a program to solve a particular problem instance. (04 Marks)

**OR**

- 2 a. Write a recursive function to find and print all possible permutations of a given set of n elements. (05 Marks)
- b. Solve the recurrence relation :  $M(n) = 2M(n - 1) + 1$ . Take  $M(1) = 1$ ,  $M(n)$  is given for  $n > 1$ . (05 Marks)
- c. Define algorithm. What are the criteria that an algorithm must satisfy? (06 Marks)

#### Module-2

- 3 a. Write a function to find the maximum and minimum elements in a given array of n elements by applying the divide and conquer technique. (06 Marks)
- b. Explain the divide and conquer technique. Give the general algorithm DAndC(P)[Where P is the problem to be solve] to illustrate this technique. (04 Marks)
- c. Apply source removal method to obtain topological sort for the given graph in Fig.Q3(c). (06 Marks)

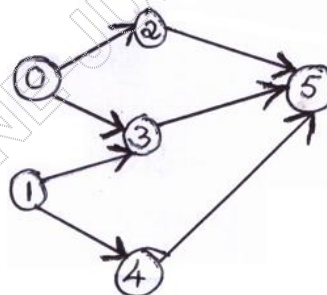


Fig.Q3(c)

**OR**

- 4 a. Explain the merge sort algorithm. Illustrate with an example and give the worst case efficiency of merge-sort. (08 Marks)
- b. Apply quick sort algorithm to the following set of numbers.  
65, 70, 75, 80, 85, 60, 55, 50, 45. (08 Marks)

**Module-3**

- 5 a. Apply greedy method to obtain an optimal solution to the knapsack problem given  $M = 60$ ,  $(w_1, w_2, w_3, w_4, w_5) = (5, 10, 20, 30, 40)$   $(p_1, p_2, p_3, p_4, p_5) = (30, 20, 100, 90, 160)$ . Find the total profit earned. (04 Marks)
- b. Explain Huffman algorithm. With an example show the construction of Huffman tree and generate the Huffman code using this tree. (06 Marks)
- c. Apply Prim's algorithm to obtain a minimum spanning tree for the given weighted connected graph. [Fig.Q5(c)]. (06 Marks)

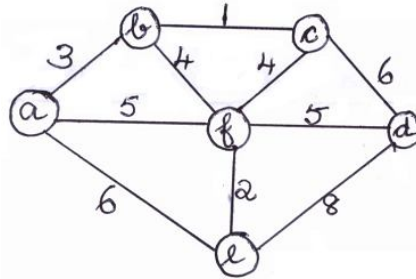


Fig.Q5(c)

**OR**

- 6 a. Explain the bottom up heap construction algorithm with an example. Give the worst case efficiency of this algorithm. (08 Marks)
- b. Apply single source shortest path problem assuming vertex a as source. [Refer Fig. Q6(b)]. (08 Marks)

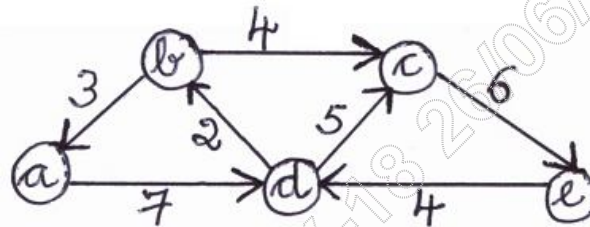


Fig.Q6(b)

**Module-4**

- 7 a. Explain multistage graph with an example. Write multistage graph algorithm using backward approach. (08 Marks)
- b. Apply Floyd's algorithm to solve all pair shortest path problem for the graph given below in Fig.Q7(b). (08 Marks)

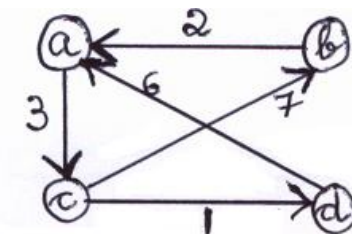


Fig.Q7(b)

OR

- 8 a. Explain Bellman Ford al to find shortest path from single source to all destinations for a directed graph with negative edge cost. (08 Marks)
- b. Apply Warshall's algorithm to the digraph given below in Fig.Q8(b) and find the transitive closure. (08 Marks)

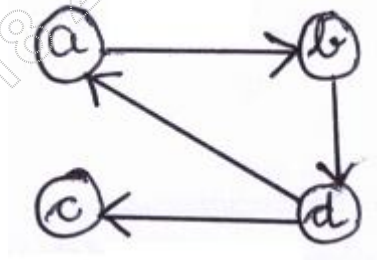


Fig.Q8(b)

**Module-5**

- 9 a. Apply backtracking method to solve subset-sum problem for the instance  $d = 30$  and  $S = \{5, 10, 12, 13, 15, 18\}$ . Give all possible solutions. (08 Marks)
- b. Explain how travelling salesman problem can be solved using branch and bound technique. (06 Marks)
- c. Define deterministic and non deterministic algorithms. (02 Marks)

OR

- 10 a. What is Hamiltonian cycle? Explain the algorithm to find the Hamiltonian cycle in a given connected graph. Write the functions used for generating next vertex and for finding Hamiltonian cycles. (09 Marks)
- b. Apply the best-first branch-and-bound algorithm to solve the instance of the given job assignment problem. (07 Marks)

Job1	Job2	Job3	Job4	
9	2	7	8	Person a
6	4	3	7	Person b
5	8	1	8	Person c
7	6	9	4	Person d

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