15CS43

USN

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)**

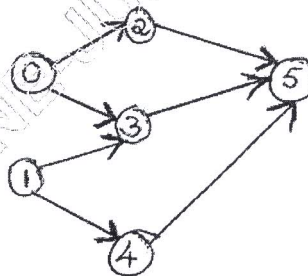   c. Apply source removal method to obtain topological sort for the given graph in Fig.Q3(c). **(06 Marks)**

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)**
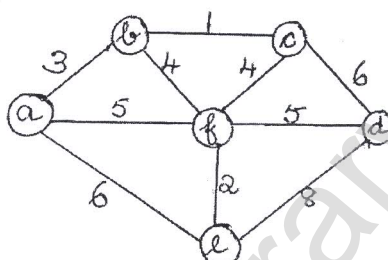

Fig.Q5(c)

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)**
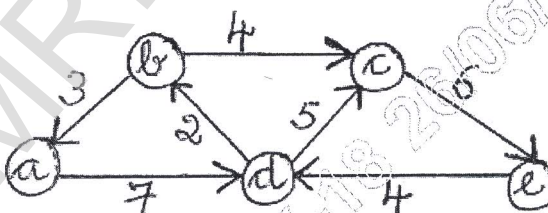

Fig.Q6(b)

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)**
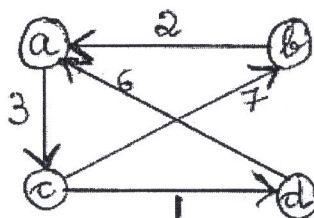

Fig.Q7(b)

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)**
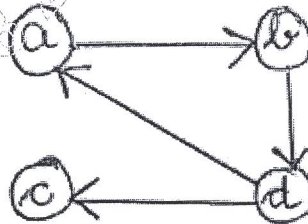

Fig.Q8(b)

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