USN ☐☐☐☐☐☐☐☐☐☐ **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)**
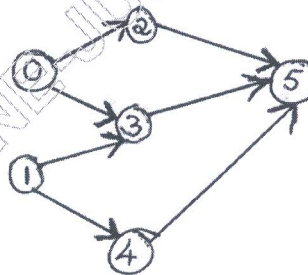

Fig.Q3(c)

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)**

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)**
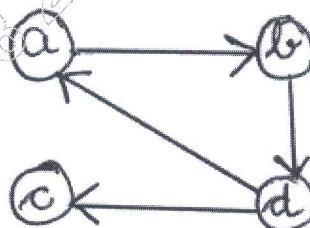

Fig.Q8(b)

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)**

$$\begin{array}{cccc} \text{Job1} & \text{Job2} & \text{Job3} & \text{Job4} \\ \end{array}$$

$$\begin{pmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{pmatrix} \begin{array}{l} \text{Person a} \\ \text{Person b} \\ \text{Person c} \\ \text{Person d} \end{array}$$

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