USN

16MCA33

Third Semester MCA Degree Examination, Dec.2017/Jan.2018
Analysis and Design of Algorithms

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1   a. Define algorithm. Explain the steps involved in algorithm design and analysis process with neat diagram. **(10 Marks)**

   b. Explain the following asymptotic notations :
      i) Big oh   ii) Big Omega   iii) Big Theta. **(06 Marks)**

OR

2   a. Prove the following theorem
      If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then if
      $t_1(n) + t_2(n) \in O(\max \{g_1, (n), g_2(n)\})$. **(06 Marks)**

   b. Explain the tower of Hanoi Puzzle and analyze its efficiency. **(10 Marks)**

Module-2

3   a. Write an algorithm for bubble sort and obtain an expression for number of times basic operation is executed. **(06 Marks)**

   b. Write an algorithm for merge sort. Find the time complexity of merge sort. **(10 Marks)**

OR

4   a. Write an algorithm for quick sort and analyze it efficiency. **(10 Marks)**

   b. Define Exhaustive search. Discuss travelling sales man problem and find the solution using exhaustive technique for the following graph, in Fig Q4(b). **(06 Marks)**
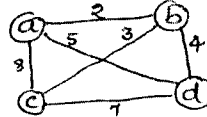

Fig Q4(b)

Module-3

5   a. What do you mean by topological order of graph. Find the topological order of the given graph, in Fig Q5(a) by using source removal method. **(05 Marks)**
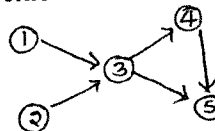

Fig. Q5(a)

   b. Write the pseudo code for insertion sort algorithm Trace the algorithm for the following input 89, 45, 68, 90, 29, 34, 17. **(06 Marks)**

   c. Write Johnson – Trotter algorithm for generating permutation. Apply this algorithm for generating permutation when n = 3. **(05 Marks)**

OR

6 a. Write the Prim's algorithm. Apply this algorithm to the following graph in Fig Q6(a) to construct minimum spanning tree. (08 Marks)
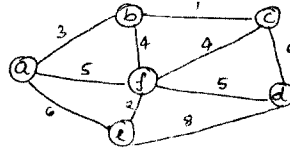

Fig. Q6(a)

   b. Construct Huffman code for the following data :

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

Obtain the Huffman code and encode the text ABCABC – AD.
Decode the string whose encoding is 11111001010101. (08 Marks)

Module-4

7 a. Write Horspool's string matching algorithm. Apply this to find the pattern "BARBER" in the text JIM_SAW_ME_IN_A_BARBER_SHOP. (08 Marks)

   b. Write the alogirhm for comparisons counting sort. Sort 13, 11, 12, 13, 12, 12 by distribution counting method. (08 Marks)

OR

8 a. Discuss the Knapsack problem by dynamic programming with respect to the following example capacity w = 5. (08 Marks)

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

   b. Write the Warshall's algorithm for computing transitive closure. Apply the algorithm for the following diagraph, Fig Q8(b). (08 Marks)
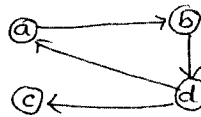

Fig. Q8(b)

Module-5

9 a. Explain P, NP and NP complete problems with example. (06 Marks)

   b. What is state space tree? Draw the state space tree of the Backtracking algorithm applied to the instance S = {3, 5, 6, 7} and d = 15 of the subset sum problem. (10 Marks)

OR

10 a. What are lower – bound arguments? Describe in brief different methods for obtaining lower bound. (08 Marks)

   b. Write a problem statement for the assignment problem and find the optimal solution for the following instance with the construction of state space tree. (08 Marks)

	Job 1	job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4