CBCS Scheme

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)**

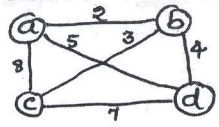

Fig Q4(b)

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.

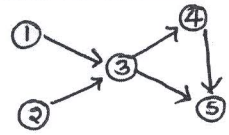

Fig. Q5(a) **(05 Marks)**

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)**

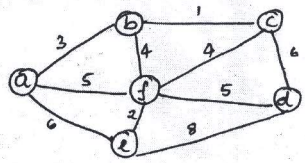

Fig. Q6(a)

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)**

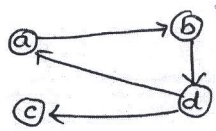

Fig. Q8(b)

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