CBCS SCHEME

USN | | | | | | | | | | |

18MCA33

Third Semester MCA Degree Examination, Dec.2019/Jan.2020
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the fundamentals of algorithmic problem solving with a neat diagram. **(10 Marks)**

b. Define the asymptotic notations. **(06 Marks)**

c. Compare the orders of growth of the following using limits:
i) $\log_2 n$ and $\sqrt{n}$ ii) $n!$ and 2^n **(04 Marks)**

OR

2 a. Explain the mathematical analysis of recursive algorithms with an example of Tower of Hanoi puzzle. **(10 Marks)**

b. If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ Prove that $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ **(06 Marks)**

c. Explain the principal ways of representing graphs for computer algorithms. **(04 Marks)**

Module-2

3 a. Explain bubble sort algorithm with its efficiency. **(06 Marks)**

b. Discuss divide and conquer strategy for designing algorithms. Apply it for multiplication of large integers. **(08 Marks)**

c. Write pseudocode for merge sort. **(06 Marks)**

OR

4 a. Explain quick sort algorithm with its efficiency. Trace the algorithm for the following input: 5, 3, 1, 9, 8, 2, 4, 7 **(10 Marks)**

b. Design an algorithm for string matching problem using brute force technique. Apply it to search a pattern ABABC in the text BAABABABCCA. **(06 Marks)**

c. Apply exhaustive search for travelling salesman problem to the given graph in Fig.Q.4(c). **(04 Marks)**

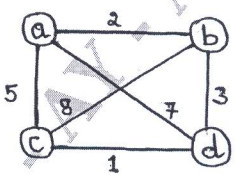


Fig.Q.4(c)

Module-3

5 a. Explain Prim's algorithm with its efficiency. Trace the algorithm for the graph given in Fig.Q.5(a). **(10 Marks)**

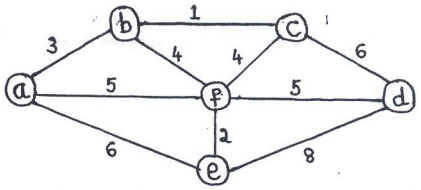


Fig.Q.5(a)

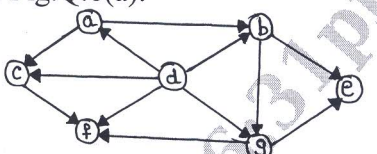
b. Write Johnson-Trotter algorithm. Apply it to generate permutations for n = 3. **(06 Marks)**

c. Explain decrease and conquer algorithm design technique. **(04 Marks)**

OR

6 a. Write an algorithm for DFS traversal. Explain how DFS can be used to solve topological sorting with the graph shown in Fig.Q.6(a). **(10 Marks)**

Fig.Q.6(a)



b. Construct Huffman tree for the following data:

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode DAD and Decode 10011011011101 **(06 Marks)**

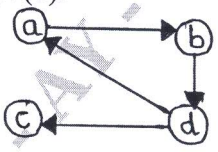
c. Differentiate DFS and BFS. **(04 Marks)**

Module-4

7 a. Write Horspool's string matching algorithm. Apply it to search the pattern BARBER in the given text
JIM_SAW_ME_IN_A_BARBERSHOP **(10 Marks)**

b. Explain the Warshall's algorithm for computing transitive closure. Apply the algorithm for the following digraph shown in Fig.Q.7(b). **(10 Marks)**

Fig.Q.7(b)

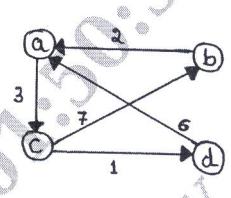


OR

8 a. Explain the comparison counting sort algorithm with its efficiency. Sort the elements 13, 11, 12, 13, 12, 12 by using distribution counting method. **(10 Marks)**

b. Explain Floyd's algorithm with pseudocode and find all-pairs shortest path for the given diagraph Fig.Q.8(b). **(10 Marks)**

Fig.Q.8(b)



Module-5

9 a. Explain P, NP and NP-Complete problems. **(08 Marks)**

b. Draw a decision tree to sort three elements by insertion sort and find its lower bound. **(06 Marks)**

c. Apply backtracking to solve the subset sum problem for the instance
S = {5, 7, 8, 10} and d = 15 **(06 Marks)**

OR

10 a. Explain how backtracking can be used to solve n-queens problem. Find the solution of 4-queens problem using Board's symmetry. **(10 Marks)**

b. Explain branch and bound technique. Solve the following assignment problem:

	J1	J2	J3	J4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(10 Marks)

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