

# CBGS SCHEME

18MCA33

18Y19MCA91

## 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

- Explain the fundamentals of algorithmic problem solving with a neat diagram. (10 Marks)
- Define the asymptotic notations. (06 Marks)
- 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

- Explain the mathematical analysis of recursive algorithms with an example of Tower of Hanoi puzzle. (10 Marks)
  - 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)
  - Explain the principal ways of representing graphs for computer algorithms. (04 Marks)

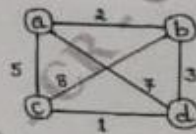
### Module-2

- Explain bubble sort algorithm with its efficiency. (06 Marks)
  - Discuss divide and conquer strategy for designing algorithms. Apply it for multiplication of large integers. (08 Marks)
  - Write pseudocode for merge sort. (06 Marks)

OR

- Explain quick sort algorithm with its efficiency. Trace the algorithm for the following input: 5, 3, 1, 9, 8, 2, 4, 7. (10 Marks)
  - Design an algorithm for string matching problem using brute force technique. Apply it to search a pattern ABABC in the text BAABABABCCA. (06 Marks)
  - Apply exhaustive search for travelling salesman problem to the given graph in Fig.Q.4(c). (04 Marks)

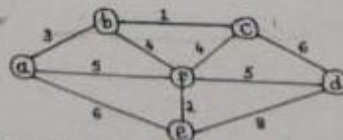
Fig.Q.4(c)



### Module-3

- 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)



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

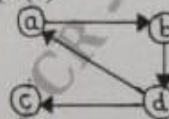
(06 Marks)  
(04 Marks)

- c. Differentiate DFS and BFS.

**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)

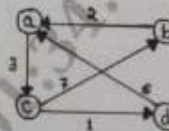
Fig.Q.7(b)



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 diagram 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)