



CBCS SCHEME

16/17MCA33

Third Semester MCA Degree Examination, Jan./Feb. 2021 Analysis and Design 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. Define algorithm. Explain the steps involved in algorithm design and analysis process with a neat diagram. (10 Marks)
b. Solve the recurrence relation and draw a tree of recursive call for tower of Hanoi problem. (06 Marks)

OR

- 2 a. List the steps involved in the time efficiency of a non-recursive algorithms and write an algorithm to find the largest element in a list of 'n' numbers. (08 Marks)
b. Write formal definitions of asymptotic notations with graph representation. (08 Marks)

Module-2

- 3 a. Write an algorithm for selection sort and obtain an expression for number of times basic operation is executed. (08 Marks)
b. Apply Strassen's algorithm to multiply the given two matrices:

$$A = \begin{bmatrix} 1 & 2 \\ 5 & 6 \end{bmatrix} \text{ and } B = \begin{bmatrix} 8 & 7 \\ 1 & 2 \end{bmatrix}$$

(08 Marks)

OR

- 4 a. Write an algorithm for Quick Sort. Find the time complexity of Quick sort using Master's theorem. (08 Marks)
b. Discuss the brute force string matching algorithm. Compute the best and worst case time complexity. (08 Marks)

Module-3

- 5 a. Write an algorithm for insertion sort, and find the time complexity of insertion sort in worst case situation. (06 Marks)
b. Write an algorithm to traverse the Graph using BF's method. Apply Breadth First search (BFS) traversal method for the following graph: (10 Marks)

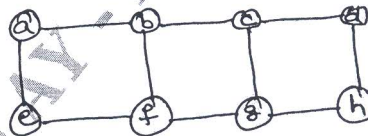


Fig. Q5 (b)

OR

- 6 a. Write an algorithm for sorting by distribution by counting. Apply the same algorithm to sort the elements:
12, 13, 10, 12, 10, 12, 11, 10, 13 (08 Marks)
b. Write an Horspool's algorithm of string matching and apply the same to search a pattern BAOBAB in the text, BEST-KNEW-ABOUT-BAOBABS (08 Marks)

Module-4

- 7 a. Give Floyd's algorithm for solving all-pair shortest path and apply the same for the given graph. (08 Marks)

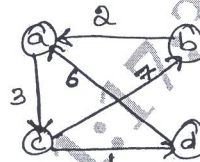


Fig. Q7 (a)

- b. Discuss the Huffman algorithm for encoding and decoding. Following is the list of characters and their probability of occurrence. Construct a Huffman tree. Encode the text "ABACABAD". Decode the code 100010111001010. (08 Marks)

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

OR

- 8 a. Obtain the shortest distance and shortest path from node 'a' to all the other nodes in a given graph. (08 Marks)

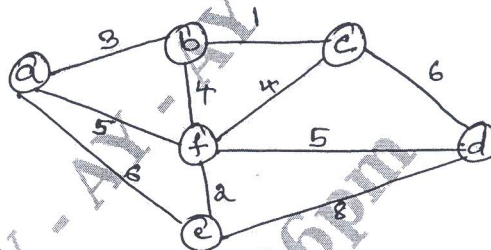


Fig. Q8 (a)

- b. Explain 0/1 knapsack problem. Solve the following knapsack to find maximum profit using dynamic programming.

Item	Weight	Value
1	3	25
2	1	20
3	2	40

Capacity of knapsack $W = 4$.

(08 Marks)

Module-5

- 9 a. Find the subset from the given sum using back tracking method. $S = \{3, 5, 6, 7\}$ and $d = 15$. (08 Marks)
 b. Discuss P, NP and NP complete problems (08 Marks)

OR

- 10 a. Discuss n-Queen's problem. Draw a state-space tree to solve n-Queen's problem for $n = 4$. (08 Marks)
 b. Solve the following assignment problem, and find the optimal solution for the following instance with the construction of state-space tree. (08 Marks)

	Job1	Job2	Job3	Job4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4
