

CBCS SCHEME

18MCA33



USN

--	--	--	--	--	--	--	--	--	--

Third Semester MCA Degree Examination, July/August 2021 Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Explain the steps involved in problem solving with a neat flow chart. (10 Marks)
b. Consider the following algorithm and answer the following :
Algorithm Unknown (n)
// Input : A non-negative integer n
s ← 0
for i ← 1 to n do
 s ← s + i * i
return s
(i) What does this algorithm computers?
(ii) What is its Basic Operation?
(iii) How many times the B.O is executed?
(iv) What is the efficiency class of this algorithm?
(v) Suggest an improvement or a better algorithm and indicate its efficiency class. (10 Marks)
- 2 a. Explain the notations used to compare and rank the order of growth of algorithm with a suitable example. (10 Marks)
b. Give the general plan for analyzing the recursive algorithm. Design and analyze the algorithm for finding the factorial of a given number. (10 Marks)
- 3 a. Write an algorithm to sort given elements using Bubble sort and find the time efficiency. (10 Marks)
b. Write an algorithm to find the key element in the list using Binary search algorithm. Apply the same for the given data A[10, 20, 30, 40, 50] when (i) key = 30 (ii) key = 20 and (iii) key = 60. Find the number of times the B.O executed for each case. (10 Marks)
- 4 a. Write an algorithm to sort given elements using merge sort. (07 Marks)
b. Apply Quick Sort algorithm to the given list, A[e, x, a, m, p, l, e] in alphabetical order. Draw the tree of the recursive calls made. (07 Marks)
c. Obtain the tree traversal for the given trees in inorder, preorder, postorder. (06 Marks)

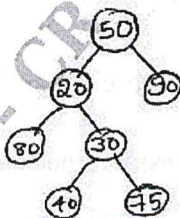


Fig. Q4 (c)

- 5 a. Write the differences and similarities between DFS and BFS. (06 Marks)
b. Travers the given graph using BFS and DFS. (08 Marks)

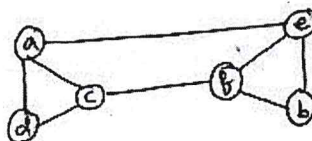


Fig. Q5 (b)

- c. Write an algorithm to traverse the graph using DFS method. (06 Marks)

- 6 a. Find the minimum spanning tree for the given graph using Prim's algorithm. (07 Marks)

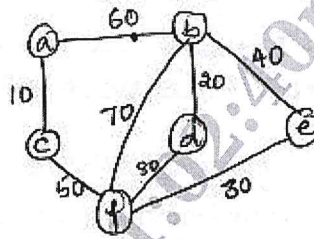


Fig. Q6 (a)

- b. Obtain the Huffman's Tree and Huffman's code for the following data and encode :
 (i) AMAR, (ii) RAM.

Character	A	M	R	-	
Frequency	400	200	300	100	(07 Marks)

- c. Write an algorithm to find the single source shortest path problem using Dijkstra's algorithm. (06 Marks)

- 7 a. Write an algorithm to sort given n elements using comparison counting method and apply the same for A[25, 45, 10, 20, 50, 15] (10 Marks)

- b. Write an algorithm to compute Binomial co-efficient and find 7C_3 . (10 Marks)

- 8 a. Write an algorithm to find transitive closure or path matrix using Warshall's algorithm. Find the path matrix for the given graph. (10 Marks)

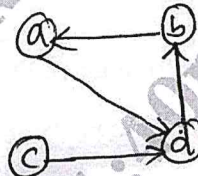


Fig. Q8 (a)

- b. Apply the bottom-up dynamic programming to the following instance of knapsack problem and find the objects. (10 Marks)

Item	Weights	Values
1	2	12
2	1	10
3	3	20
4	2	15

Maximum capacity = 5

- 9 a. Write the decision tree to sort the elements using selection sort and show that the lower bound is $\log_2 N!$ (10 Marks)

- b. Explain N-Queens problem. Construct the state space tree for placing 4 Queens. (10 Marks)

- 10 a. Construct the state-space tree for sum of subset problem for the given data:
 Set = {5, 10, 12, 13, 15, 18} and M = 30. (10 Marks)

- b. Find the optimal solution for the given assignment problem using branch and bound method.

	J ₁	J ₂	J ₃	J ₄
a	9	2	7	8
b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

J₁, J₂, J₃, J₄ = Jobs
 a, b, c, d = Persons

