CBCS SCHEME

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

18CB42

Fourth Semester B.Tech. Degree Examination, July/August 2022
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define best case, worst case and average case efficiency. Write the algorithm and give these efficiencies for sequential search. **(10 Marks)**

b. Write a recursive algorithm for binary search and also bring out its efficiency. **(10 Marks)**

OR

2 a. Consider the following algorithm :

```
Algorithm GUESS (A[ ] [ ] )
for i ← 0 to n – 1
    for j ← 0 to i
        A[i] [j] ← 0
```

i) What does the algorithm compute?
ii) What is basic operation?
iii) What is the efficiency of this algorithm? **(06 Marks)**

b. Explain Asymptotic notations with examples. **(08 Marks)**

c. Discuss about the important problem types and fundamental data structures. **(06 Marks)**

Module-2

3 a. Explain divide and conquer with its general method. **(04 Marks)**

b. Design merge sort algorithms. Sort the given numbers using merge sort.
14, 19, 15, 5, 12, 75, 98. **(08 Marks)**

c. Apply Stassen's matrix multiplication to multiply following matrices.

$$\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 1 & 6 \end{bmatrix}.$$ **(08 Marks)**

OR

4 a. Develop an algorithm for quicksort and sort the following elements using Quicksort
65, 70, 75, 80, 60, 55, 50, 45. **(10 Marks)**

b. Illustrate the topological sorting using DFS and source removal algorithm for the following graph.

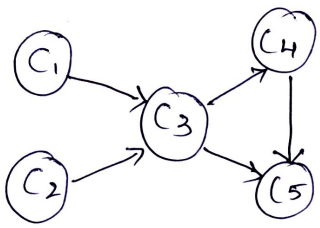

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Apply greedy method to obtain an optimal solution to the knapsack problem given.
M = 60, (W1, W2, W3, W4, W5) = (5, 10, 20, 30, 40)
(P1, P2, P3, P4, P5) = (30, 20, 100, 90, 160). **(08 Marks)**

b. Let n = 5, Profit (10, 3, 33, 11, 40) and deadlines (3, 1, 1, 2, 2). Find the optimal sequence of execution of job solution using greedy algorithm. **(06 Marks)**

c. Define minimum cost spanning tree. Write Prim's algorithm to find minimum cost spanning tree. **(06 Marks)**

OR

6 a. Write Dijkstra algorithm to find single source shortest path. Apply Dijkstra algorithm to find the all pair shortest path for the given graph given in Fig.Q6(a). Consider node 'a' as source.

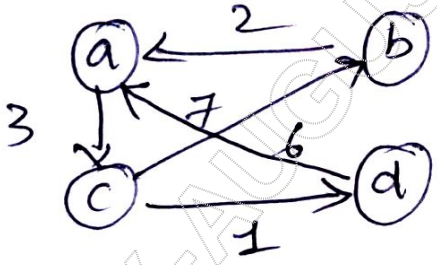

Fig.Q6(a) **(10 Marks)**

b. Give the algorithm for Bottom-up construction of heap. Sort the given list of numbers using heapsort 2, 9, 7, 6. 5, 8. **(10 Marks)**

Module-4

7 a. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Mention its time efficiency. **(10 Marks)**

b. Write Floyd's algorithm to find all pair shortest path and apply Floyd's algorithm on given graph to find all pair shortest path.

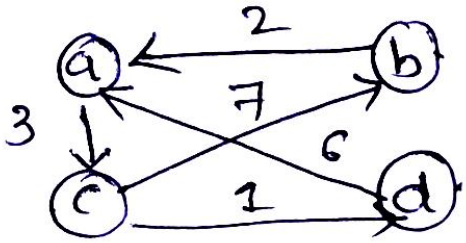

Fig.Q7(b) **(10 Marks)**

OR

8 a. Explain multistage graph with example. Write multistage graph algorithm to forward approach. **(10 Marks)**

b. Apply bottom up dynamic programming algorithm for the following instance of knapsack problem. Knapsack capacity = 10.

Item	Weight	Value
1	7	42
2	3	12
3	4	40
4	5	25

(10 Marks)

Module-5

9 a. Solve the given instance of sum of subset problem S = {3, 5, 6, 7} and d = 15. Construct a State Space Tree. **(10 Marks)**

b. Apply the branch and bound algorithm to solve the travelling salesman problem for the following graph shown in Fig.Q9(b). Start city is 'a'. Give the state space tree.

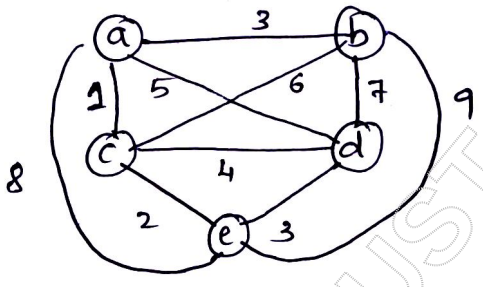

Fig.Q9(b) **(10 Marks)**

OR

10 a. Explain the class of NP – Hard and NP – Complete. **(10 Marks)**

b. Apply best first Branch and Bound algorithm to solve the instance of the given job assignment problem.

J_1	J_2	J_3	J_4	
9	2	7	8	Person a
6	4	3	7	Person b
5	8	1	8	Person c
7	6	9	4	Person d

(10 Marks)

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