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10CS43

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Design and Analysis of Algorithms

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Give the informal definition of Asymptomatic Notations.   **(07 Marks)**
   b. Prove that $(n + a)^b = \theta (n^b)$ if b > a.   **(05 Marks)**
   c. Design an algorithm for bubble sort and find its time efficiency. Is it a stable and In place algorithm.   **(08 Marks)**

2 a. Explain the Divide and conquer technique. Design and analyze Quick sort algorithm with example for Best case and worst cases.   **(10 Marks)**
   b. Apply merge sort to sort the list E, X, A, M, P, L, E in alphabetical order.   **(05 Marks)**
   c. What is defective Chess Board problem? Explain tiling of 8×8 chess board.   **(05 Marks)**

3 a. Find the optimal solution to the Knapsack problem.
       $(P_1, P_2, P_3, P_4, P_5) = (30, 20, 100, 90, 160)$
       $(W_1, W_2, W_3, W_4, W_5) = (5, 10, 20, 30, 40)$
       Capacity of Knapsack w = 60 (Greedy method).   **(06 Marks)**
   b. Design and Analyze the Dijkstra's Algorithm. Write algorithm and apply it to the following graph.

Fig Q3(b)   **(10 Marks)**
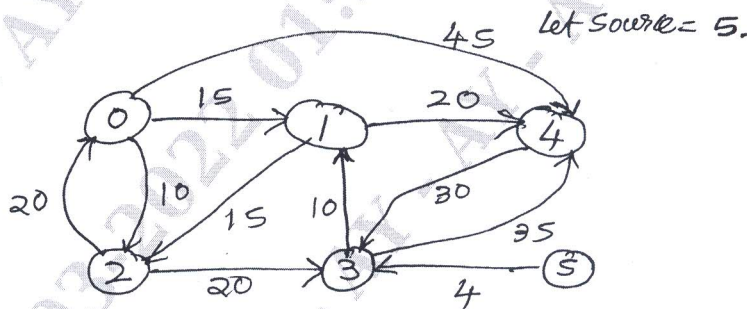
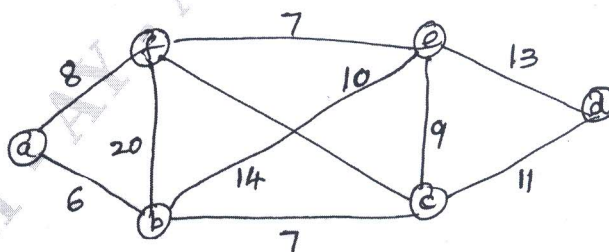   c. Apply Kruskal's method to find the minimum cost spanning tree for the graph given in below Fig Q3(c) :

Fig Q3(c)   **(04 Marks)**

4 a. Differentiate between Divide and Conquer Vs Dynamic programming. Design and Analyze the Warshall Algorithm for the following graph. [Refer Fig Q4(a)]
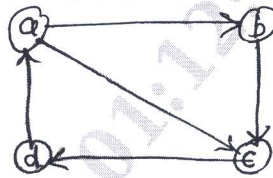

Fig Q4(a)   (10 Marks)

   b. Find the all-pair shortest path problem for the following graph. [Refer Fig Q4(b)]

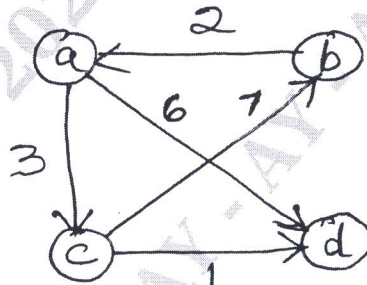Fig Q4(b)   (05 Marks)

   c. Solve the Travelling sales persons problem for the following given matrix

$$\text{Cost} = \begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

(05 Marks)

PART – B

5 a. Compare and contrast BFS and DFS Traversal. Apply source Removal method to solve Topological sorting problem for the following graph. [Refer Fig Q5(a)]
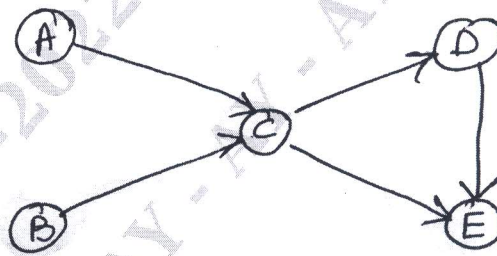

Fig Q5(a)   (10 Marks)

   b. With help of comparison counting method. Sort the following list
       45, 2, 19, 10, 33, 22, 1, 23   (05 Marks)
   c. Explain with an example Boyer-Moore algorithm for string matching problem.   (05 Marks)

6 a. What are decision Trees? Explain how decision trees are used in sorting algorithm?
                                                                           (08 Marks)
   b. Write a note on Tractable and intractable problems.   (06 Marks)
   c. What are the Numerical Algorithms? What are the challenges of numerical Algorithm?
                                                                           (06 Marks)

7 a. Construct the state space tree for sum of subset problem given the following data m = 15, w = {3, 5, 6, 7}. **(06 Marks)**

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

	J1	J2	J3	J4
a	9	2	7	8
b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

(08 Marks)

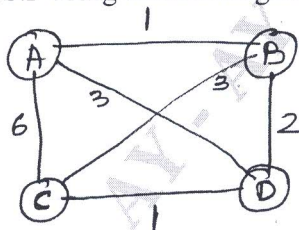c. Solve the following instance of T.S.P using nearest neighbor algorithm.[Refer Fig Q7(c)]

Fig Q7(c) **(06 Marks)**

8 a. What is prefix computation? Let the input to prefix computation problem be 5, 12, 8, 6, 3, 9, 11, 12, 1, 5, 6, 7, 10, 4, 3, 5 and Let ⊕ stands for addition. Solve the problem using optimal algorithm. **(10 Marks)**

b. Explain the concept of list Ranking algorithm with an example. **(06 Marks)**

c. Write a note on N-Queen problem. **(04 Marks)**

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