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**Question Paper Code: U4203**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fourth Semester

Computer science and Engineering

21UCS403- ALGORITHM ANALYSIS

(Regulations 2021)

(Common to IT, AI&DS, CSD and CSE(AIML) Engineering branches)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

1. How will you measure an input size to develop an algorithm? CO1-U
2. Compare the orders of growth of  $\frac{1}{2}n(n-1)$  and  $n^2$ . CO2-App
3. What is the worst case complexity of Binary Search? Justify your answer with an example. CO1-U
4. Differentiate the methods involved in Brute force approach and Divide & Conquer approach. CO1-U
5. Find an optimal Huffman Code for the following set of frequencies:  
a: 50 b: 25 c: 15 CO2-App
6. Define dynamic programming with an example. CO1-U
7. Analyze the time complexity of Hamiltonian circuit problem. CO2-App
8. Write the steps involved in Knapsack Problem with its analysis CO1-U
9. What is meant by NP hard and NP complete? CO1-U
10. Search an element x on A[1:n] where  $n \geq 1$ , on successful search return j if a[j] is equals to x otherwise return 0. Writ an algorithm for the given problem statement. CO2-App

PART – B (5 x 16= 80Marks)

11. (a) Discuss in detail about the calculation of time efficiency for the algorithm to place the largest to smallest disc in a Tower C, provided that Tower A and Tower B with 3 disc s and 2 discs respectively. CO2-App (16)

Or

(b) Solve the following recurrence relations. CO2-App (16)

$$x(n) = x(n - 1) + 5 \text{ for } n > 1, x(1) = 0$$

$$x(n) = 3x(n - 1) \text{ for } n > 1, x(1) = 4$$

$$x(n) = x(n - 1) + n \text{ for } n > 0, x(0) = 0$$

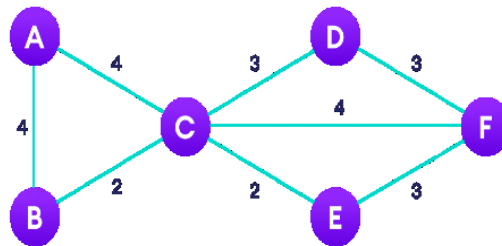
$$x(n) = x(n/2) + n \text{ for } n > 1, x(1) = 1 \text{ (solve for } n = 2k)$$

12. (a) Apply merge sort algorithm to sort the given numbers CO2-App (16)  
 40,55,63,17,22,68,89,97 and also analyze the efficiency of this algorithm

Or

(b) Apply quick sort and bubble sort to sort the following array CO2-App (16)  
 A [5, 3, 1, 9, 8, 2, 4, 7]. Compare its efficiency

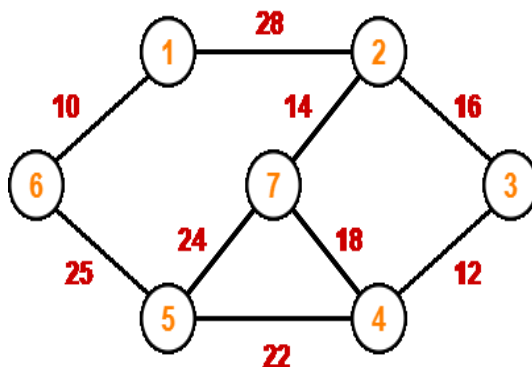
13. (a) Apply the Floyd- Warshall algorithm for the given graph and find CO2- App (16)  
 out the entire pairs shortest path.



Step:1

Or

(b) Apply Prim's algorithm for the given weighted graph and find the CO2- App (16)  
 minimum cost of the graph



14. (a) Consider knapsack problem:  $n = 8$ .  $(W_1, W_2, W_3, W_4, W_5, W_6, W_7, W_8) = (1, 11, 21, 23, 33, 43, 45, 55)$ ,  $P = (11, 21, 31, 33, 43, 53, 55, 65)$ ,  $m = 110$ . Solve the problem using Branch and Bound approach. CO2- App (16)
- Or
- (b) The N-queens puzzle is the problem of placing N chess queens on an  $N \times N$  chessboard so that no two queens threaten each other. Thus, the solution requires that no two queens share the same row, column, or diagonal. Use the suitable technique to print all possible solution to this problem by assigning n as 4. CO2- App (16)
15. (a) Consider the Travelling Salesman Problem and check whether the problem can be solved in NP time. If so, Justify your answer with proper explanation CO1-U (16)
- Or
- (b) Whether Hamiltonian Circuit problem is an NP hard Problem? Justify your answer with proper explanation CO1-U (16)

