B.Tech. (Computer Technology) Fifth Semester (C.B.C.S.) Winter 2022

Design and Analysis of Algorithms

SPM/KW/22/2672

P. Pages : 2

Time : Three Hours

Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Diagrams and chemical equations should be given whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Define algorithm. Explain its properties. 6

b) Solve the following recurrence relation using master theorem: 8

i) $T(n) = 4T(n/2) + n^2$

ii) $T(n) = 2T(n/2) + n^3$

iii) $T(n) = 8T(n/2) + n^2$

OR

2. a) State and explain Asymptotic notations used for analyzing the algorithm. 7

b) Write an algorithm of insertion sort with example. Derive its best case and worst case time complexity. 7

3. a) State the algorithm of Huffman coding. Find Huffman codes for following set of frequencies: 7
a:20 b:10 c:05 d:25 e:35

b) What is Divide and Conquer strategy? Write Binary search algorithm, State with example. 7

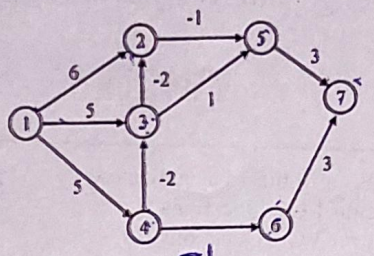
OR

4. a) Find the optimal solution to the fractional knapsack problem, if the Knapsack capacity w=60. 7

Item	1	2	3	4	5
Weight	5	10	20	30	40
Cost	30	20	100	90	160

b) Give 09 activities along with their start and finished time. 7
A{1 2 3 4 5 6 7 8 9}
Si{1 2 4 1 5 8 9 11 13}
Fi{3 5 7 8 9 10 11 14 16}
Compute a schedule where largest number of activities takes place. Write an algorithm of Activity selection problem.

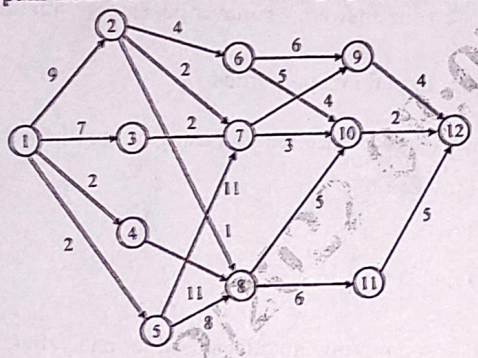
5. a) Illustrate Bellman-Ford algorithm. Find the shortest distance using Bellman-Ford algorithm for given graph. 7



b) Determine LCS of X=(A, B, C, B, D, A, B) and Y(B, D, C, A, B, A). Write an algorithm to generate longest common subsequence. 7

OR

6. a) Find a minimum cost path from s to t in the multistage graph using forward approach. 8



b) Differentiate between Greedy approach and Dynamic approach. 6

7. a) Illustrate 4-Queen problem and give its algorithm using backtracking method. 7

b) Discuss Hamiltonian cycle. Write an algorithm for finding Hamiltonian cycle for a graph. 7

OR

8. a) State graph coloring method with example. Give algorithm for graph coloring method. 7

b) Apply backtracking algorithm. Solve the following sum of subset problem. 7
N = 4 m = 31
{x1, x2, x3, x4} = {7, 11, 13, 24}

9. a) Differentiate between Decision problem and optimization problem with suitable example. 7

b) Explain the concept of polynomial reduction and how it can be used for showing NP completeness of problem. 7

or

10. a) Write short note on: 6
i) P class of problem ii) NP class of problem iii) NP complete problem

b) Explain in detail about Cook's theorem. 4

c) What is non deterministic algorithm? Write an non-deterministic algorithm. 4

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