B.Tech. (Computer Science & Engineering) Fifth Semester (C.B.C.S.)

Design & Analysis of Algorithms

P Pages 2

Time Three Hours

PSM/KW/23/2691

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. Illustrate your answers whenever necessary with the help of neat sketches
8. Assume suitable data whenever necessary
9. Due credit will be given to neatness and adequate dimensions

1. a) Explain principles of designing on algorithm in brief. 7

b) Solve the following using master theorem. 7

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

OR

2. a) What is sorting Network? Explain half cleaner circuit. Design a 8 bit bitonic sorting network and explain its operation for 1, 7, 5, 8, 2, 6, 9, 3. 7

b) Explain Asymptotic notations. Find upper bound, lower bound and tight bound range for following 7

i) $21n^2 + 9n + 6$ ii) $5n + 12$

3. a) Solve the following using partial knapsack. n = 7 and M = 15 7

$(P1, P2 \ldots P7) = (15, 20, 10, 7, 6, 18, 3)$

$(w1, w2 \ldots w7) = (2, 3, 5, 7, 1, 4, 1)$

b) Solve Job sequencing with deadlines n = 4, P = (100, 10, 15, 27) and d = (2, 1, 2, 1) find optimal solution. Also write algorithm for the same. 7

OR

4. a) Find the multiplication of following matrices A & B given below using Strassen's matrix multiplication algorithm and calculate its complexity. 7

$$A = \begin{pmatrix} 6 & 7 \\ 5 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

b) Write an algorithm for Huffman code? Implement it on the following data and variable length encoding 7

A : 45 B : 13 C : 12 D : 16 E : 09 F : 05

5. a) Find the longest common subsequence for the following. 7

x = (1, 0, 0, 1, 0, 1, 0, 1)

y = (0, 1, 0, 1, 1, 0, 1, 1, 0)

b) Draw optimal binary search tree for n = 5 with following probabilities given 7

i	0	1	2	3	4	5
P(i)		0.15	0.10	0.05	0.10	0.20
q(i)	0.05	0.10	0.05	0.05	0.15	0.10

OR

6. a) Calculate the minimum number of scalar multiplication for following set of matrix using matrix chain multiplication 7

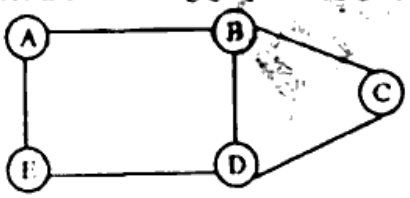
A = 4 x 5 B = 5 x 3
C = 3 x 2 D = 2 x 7

b) What is Travelling salesman problem? Implement it for the following matrix 7

$$\begin{pmatrix} 0 & 4 & 8 & 3 \\ 2 & 0 & 7 & 9 \\ 4 & 11 & 0 & 8 \\ 8 & 4 & 6 & 0 \end{pmatrix}$$

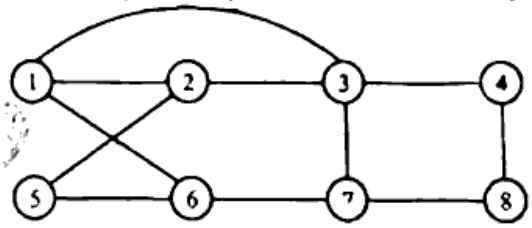
7. a) Explain how backtracking is applied to 4-Queen's problem also draw state space tree. 7

b) What is graph coloring? Color the following graph using graph coloring algorithm. 7

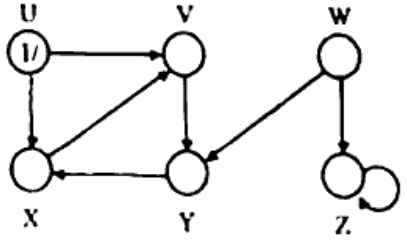


OR

8. a) What is the use of Hamiltonian cycle? Implement Hamiltonian cycle on following graph. 7



b) What is back tracking? Explain implicit & Explicit constraints. Also obtain DFS tree for following graph 7



9. a) Explain the following **any three.** 14

i) CLIQUE
ii) Independent set problem
iii) Graph partitioned into triangle
iv) Polynomial reduction
v) Decision & Optimization problem.

OR

10. a) Explain P, NP, NP complete, & NP – Hard with suitable example 9

b) Prove that $P \subseteq NP$. 5

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