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322552(22)

B. E. (Fifth Semester) Examination, April-May 2021

(New Scheme)

(CSE Branch)

ANALYSIS & DESIGN of ALGORITHMS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *All questions are compulsory. Part (a) of each question is compulsory and carry 2 marks. Attempt any* ***two*** *from part (b), (c) and (d) and carry 7 marks.*

Unit-I

1. (a) Define Big Q notation with example. 2

(b) Explain Master's theorem. Solve following relation using Master's theorem. 7

(i) $T(n) = 2T(n/2) + n^2 \log n$

(ii) $T(n) = T(n-1) + n^4$

(c) Solve the following recurrence relation using recursion tree. 7

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

(d) Write and analyze selection sort algorithm and find the time complexity. 7

Unit-II

2. (a) Explain divide and conquer method. 2

(b) Write quick sort algorithm and find time complexity. 7

(c) Explain stressen's matrix multiplication method and solve the following matrix multiplication using stressen's method. 7

$$\begin{bmatrix} 12 & 5 \\ 30 & 11 \end{bmatrix} \cdot \begin{bmatrix} 30 & 17 \\ 25 & 11 \end{bmatrix}$$

(d) Explain optimal storage on tape. Evaluate optimal ordering using greedy method for the following tape instances. 7

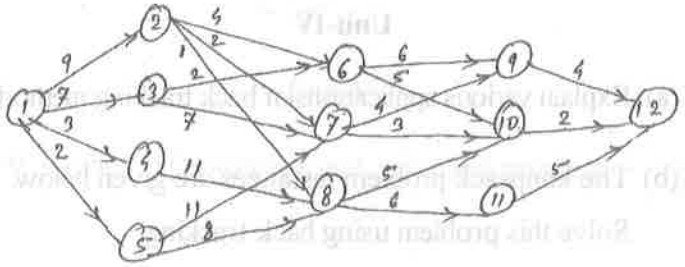
No of file on tape $n = 3$

Length of file $(l_1, l_2, l_3) = (5, 10, 3)$

Unit-III

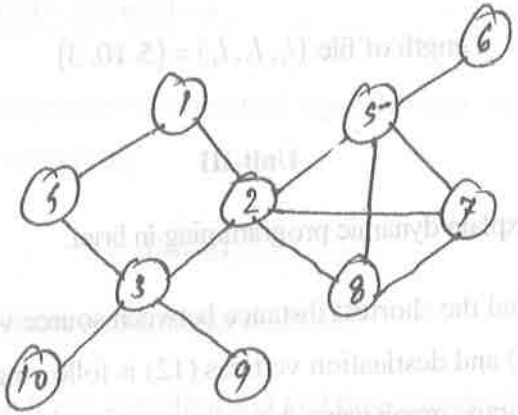
3. (a) Explain dynamic programming in brief. 2

(b) Find the shortest distance between source vertices (1) and destination vertices (12) is following multi storage graph using dynamic programming. 7



(c) Given a chain of four matrices P, Q, R, T which size 5×4, 4×6, 6×2 and 2×7. Find the optimal sequence for the computation of the multiplication operation and optimum number of multiplication using chained matrix multiplication. 7

(d) What is biconnected component? Find the articulation point of the following graph and make graph bioconnected. 7



Unit-IV

4. (a) Explain various applications of back tracking method. 2

(b) The knnpsack problem instances are given below. Solve this problem using back tracking. 7

No. of items $n = 3$ as (l_1, l_2, l_3)

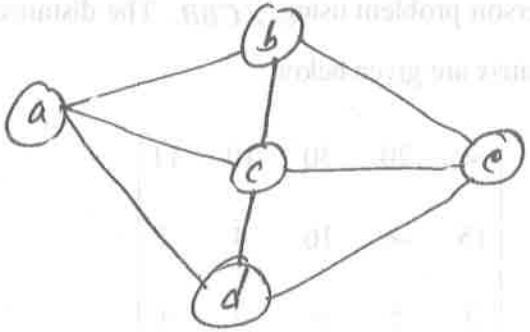
Annilable weight $w = (2, 3, 4)$

Associated value $v = (3, 4, 5)$

and Knapsock capacity $w = 5$

(c) What is graph coloring? Explain with example. 7

(d) Consider the graph $G = (V, E)$, shown is following figure. Find all Hamiltonian circuit using backtracking. 7



Unit-V

5. (a) Explain NP-complete and NP-Ward problem. 2

(b) Write control abstraction for least-cost-search technique. 7

(c) Consider the knapsack instance $n = 4$ $(p_1, p_2, p_3, p) = (10, 10, 12, 18)$, $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and knapsack capacity $m = 15$. Solve this 0/1 knapsack problem using least-cost-branch and bound $(\angle CBB)$. 7

(d) Find minimum cost-four for the travelling sales-person problem using $\angle CBB$. The distance cost matrix are given below : 7

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$