

Code No: MC1635/R16

MCA III Semester Regular/ Supplementary Examinations, Nov/Dec-2019

DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours

Max. Marks: 60

*Answer Any FIVE Questions
All Questions Carry Equal Marks*

1. a What is frequency counting method? Analyze the time complexities of matrix addition and selection sort using frequency count. [6M]
b Discuss cost amortization analysis with an example. What is the role of stack in it? [6M]
2. a How to improve the performance of union and find algorithms through weighted union and collapsing find? Explain algorithms. [6M]
b Can we solve a problem with non-polynomial time complexity? Discuss various methods for it. [6M]
3. a Find out the optimal ordering of job execution for the given $n=5$, $(p_1..p_5)=(20, 15, 10, 25, 18)$ and $(d_1..d_5)=(2, 3, 1, 2, 3)$ with the help of greedy jobs algorithm [6M]
b Differentiate the working principle of Prim's and Kruskal's algorithms in generating minimum cost spanning trees. [6M]
4. a Strassen's matrix multiplication reduces the time complexity of conventional matrix multiplication. How? Show with derivation of time complexity. [6M]
b Trace merge sort algorithm for the given array of numbers, also show the tree calls and compute the average time complexity. 31, 19, 23, 25, 57, 48, 37, 12, 92, 25, 86, 33 [6M]
5. a What is principle of optimality? How it is used in dynamic programming to solve optimization problems. [6M]
b Generate the optimal solution for 0/1 Knapsack problem when $n=4$, $m=25$ $(w_1, w_2, w_3, w_4)=(8, 10, 5, 7)$ and $(p_1, p_2, p_3, p_4)=(2, 5, 8, 1)$ [6M]
6. a What is travelling sales person problem? Show that the time complexity of it is $O(n^2n)$ and space complexity is $O(n^2n)$ using dynamic programming [6M]
b Find out the shortest path between all pairs of nodes in graph G with at least 3 nodes. [6M]
7. Write Recursive backtracking algorithm? Explain how it is used to solve sum of sum of subsets problem when $m=30$ $w=\{ 5, 8, 10, 7, 14, 16, 20\}$ by drawing the portion of state space tree. [12M]
8. a What is the role of Least Cost function in branch bound? Explain in detail with control abstraction and example. [6M]
b Generate FIFO-Branch and Bound solution for the given knapsack problem. $n=5$ $(p_1..p_5)=(9, 15, 10, 6, 4)$ $(w_1..w_5)=(4, 6, 5, 3, 3)$ and $m=15$ [6M]
