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MCS–211

MASTER OF COMPUTER APPLICATIONS

(MCA-NEW)

Term-End Examination

December, 2023

MCS-211 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours *Maximum Marks : 100*

(*Weightage : 70%*)

Note : *Question No.* ***1*** *is compulsory and carries 40 marks. Attempt any* ***three*** *questions from the rest.*

1. (a) What is Euclid's algorithm to find GCD of two given integers ? Write the steps involved in finding GCD of (a, b) using Euclid's algorithm. 5

   (b) What are Big 'O' and Big 'Θ' notations ? Explain with the help of representative diagram. 5

(c) Write and explain linear search algorithm. Mention best case, worst case and average case scenarios of linear search. 5

(d) Explain Breadth First Search (BFS) algorithm with a suitable example. 5

(e) What is Task Scheduling algorithm ? Write pseudo code for task scheduling algorithm. 5

(f) Solve the given recurrence relation using recursion tree method : 5

$$(n) = 2\mathrm{T}\left(\frac{n}{2}\right) + n$$

(g) What are P, NP and NP-complete problems ? Give example of each. 5

(h) What is a Minimum Cost Spanning Tree (MCST) ? Write Generic MCST algorithm. 5

2. (a) What are the building blocks of an algorithm ? Explain how to judge an algorithm, whether it is efficient or not ? 6

(b) Using mathematical induction, prove that the sum of first 'n' positive integers is $\left(\frac{n(n+1)}{2}\right)$ i.e. $1 + 2 + 3 \ldots\ldots\ldots + n = \frac{n(n+1)}{2}$. 6

(c) What is polynomial evaluation ? What are its methods of evaluation ? Evaluate $P(x) = 3x^2 + 5x + 6$ using Horner's rule at $x = 3$. 2+2+4

3. (a) What is Greedy approach for problem solving ? How does a Greedy algorithm work ? Write the activities performed in Greedy method. 6

(b) Explain merge sort algorithm using divide and conquer approach. Also mention its best case and worst case time complexities. 6+2

(c) Explain any *three* of the following terms with the help of a suitable diagram : 3×2=6

(i) Subgraph

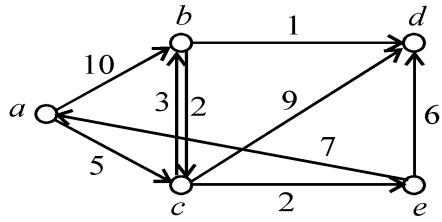
(ii) Connected graph

(iii) Adjacency matrix

(iv) Directed acyclic graph

4. (a) Show the step by step execution of Dijkstra's single source shortest path

algorithm on the given directed graph from source vertex '*a*' : 6



(b) What is string matching problem ? Explain Knuth Morris Pratt algorithm of string matching with a suitable example. Explain the process of building LPS array for a pattern 'P'. 2+4+2

(c) What is all pair shortest path problem ? Write and explain Floyd Warshall algorithm for shortest paths with the help of a diagram. 6

5. Write short notes on any ***four*** of the following : 4×5=20

(i) Tractable *vs*. Intractable problems

(ii) CNF Satisfiability problem

(iii) Optimization and decision problems

(iv) Prim's algorithm

(v) Approximation algorithms

(vi) Master's theorem