Exam.Code: 0999
Sub. Code: 34961

2076

M.E. Computer Science and Engineering

First Semester

CS-8101: Advance Algorithms

(Common with CSN-8101)

(For UIET)

Time allowed: 3 Hours | Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is Compulsory and selecting two questions from each Section.

x-x-x

Q1. Answer all the questions

i. Define asymptotic notation. Differentiate between Big-O and Big-Theta.

ii. State the recurrence relation for Binary Search.

iii. What is the objective of the Branch and Bound technique?

iv. Differentiate between EREW PRAM and CREW PRAM.

v. What is the significance of the LPS array in KMP?

vi. Why does Dynamic Programming exhibit optimal substructure?

vii. Define Decision Tree in comparison sorting.

viii. Differentiate between Las Vegas and Monte Carlo algorithms.

ix. What is polynomial-time reduction?

x. State one application of approximation algorithms. (10X1)

Section A

Q2. (a) Apply Quick Sort on the array 38, 27, 43, 3, 9, 82, 10, 15 assuming the first element as pivot in every call. Show all partitions and analyse the best, average and worst-case time complexities. (5)

(b) Solve the recurrence relation

$$T(n) = 3T(n/3) + n\log n$$

using the Master Theorem. Justify the applicable case. (5)

Q3. For the weighted graph below

Vertices: A, B, C, D, E, F

Edges: A-B(4), A-C(2), B-C(1), B-D(5), C-D(8), C-E(10), D-E(2), D-F(6), E-F(3).

(a) Construct the MST using Prim's Algorithm. (5)

(b) Determine the Single Source Shortest Paths from source A using Dijkstra's Algorithm. (5)

P.T.O.

Q4. (a) Solve the Travelling Salesman Problem using Branch and Bound for the cost matrix: (5)

A-B=10, A-C=15, A-D=20, B-C=35, B-D=25, C-D=30.

(b) Explain the Decision Tree model and derive the lower bound $\Omega(n \log n)$. (5)

Section B

Q5. (a) Solve Matrix Chain Multiplication using Dynamic Programming for matrices: A1=10×20, A2=20×5, A3=5×15, A4=15×30. Show DP table and optimal parenthesization. (5)

(b) Solve the 8-Queens problem using Backtracking with state-space tree. (5)

Q6. (a) Explain the CREW and EREW PRAM models. Discuss Parallel Prefix Sum algorithm with complexity. (5)

(b) Perform Rabin-Karp matching. (5)

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Pattern: AABA

Q7. (a) Explain Cook's Theorem and its significance in NP-Completeness. (5)

(b) State the working of Approximation Algorithms and why these are important in some problems. (5)