Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech(IT-SE)/SEM-3/MSE-303G/2011-12
2011
DESIGN AND ANALYSIS OF ALGORITHM

*Time Allotted* : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words
as far as practicable.

Answer any *five* questions.   5 × 14 = 70

1. a) Write the RAM (Random Access Machine) program for n^n with proper comments.   4

   b) Write down the codes for RASP (Random Access Stored Program) machine instruction.   4

   c) Describe TM (Turing Machine) representation of RAM (Random Access Machine) and explain how the "ADD 20" instruction will work.   6

40418   [Turn over
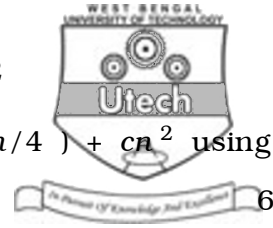
2. a) Solve the equation $T(n) = 3T(n/4) + cn^2$ using Recursion Tree Method. 6

   b) Use Master theorem to solve : 4

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

   ii) $T(n) = 16T(n/4) + n^2$.

   c) Prove that

   i) $10n^2 + 4n + 2 = \Theta(n^2)$

   ii) $6 \cdot 2^n + n^2 = 0(2^n)$. 4

3. a) Find out the complexities of insertion sort. 4

   b) Find out the complexity of Binary Search Tree. 4

   c) Find out the average case complexity of Quick Sort. 6

4. a) Explain Greedy method with an algorithm. 4

   b) Find an optimal solution to the knapsack instance
   $n = 7, m = 15, (p_1, p_2, \dots p_7) = (10, 5, 15, 7, 6, 18, 3)$
   and $(w_1, w_2, \dots w_7) = (2, 3, 5, 7, 1, 4, 1)$. 4

   c) Explain Job sequencing with deadline problem.
   Let $n = 4, (p_1, p_2, p_3, p_4)(100, 10, 15, 27)$ and
   $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$. Find all feasible
   solutions and their values. 2 + 4

5. a) Explain General Backtrack algorithm. 4

   b) Show the steps to get the solution to the 4-queen problem. 4

   c) Explain the algorithm of N-Queen problem or Graph coloring problem. 6

6. a) What is MST ? Give the algorithms for MST by Prim & Kruskal. 6

   b) For a graph of your choice find out BFS & DFS and comment about their complexities. 6

   c) Compare Graph & Tree. 2

7. a) Explain Dynamic Programming with example of TSP (Travelling Salesman Problem). 6

   b) Define the following : 4

      i) Single source shortest path

      ii) Single destination shortest path

      iii) Single pair shortest path

      iv) All pairs shortest path.

   c) Write and explain Floyd-Warshall algorithm. 4

40418 3 [Turn over
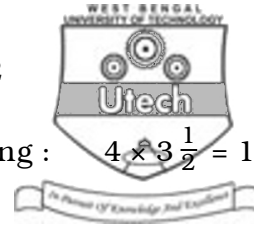
8. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

    a) 15-Puzzle problem

    b) P, NP-Hard & NP-complete class

    c) Union of Disjoint set

    d) Circuit satisfiability problem

    e) O/I knapsack problem

    f) Fast Fourier Transformation.

———————