CS-603

B. E. (Sixth Semester) EXAMINATION, June, 2009

(Computer Science & Engg. Branch)

ANALYSIS AND DESIGN OF ALGORITHMS

(CS – 603)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt one question from each Unit. All questions carry equal marks. Assume suitable data wherever necessary.

Unit – I

1. (a) Find θ-notations for the given exponential function : 8

$$f(n) = 3 * 2^n + 4 n^2 + 5 n + 3$$

(b) Sort the given array using Heap Sort. Also write the algorithm : 12

25, 42, 20, 19, 18, 52, 20

Or

2. (a) Design an algorithm to construct the first N rows of Pascal's triangle. The first four rows are given by : 8

1

1 1

1 2 1

1 3 3 1

Analyse the algorithm for time complexity.

(b) Arrange the following growth rates in the increasing order :   4

$O(n^3)$, $O(1)$, $O(n^2)$, $O(n \log n)$, $O(n^2 \log n)$, $\Omega(n^{0.5})$, $\Omega(n \log n)$, $\theta(n^3)$, $\theta(n^{0.5})$

(c) Write Heapify algorithm. Explain with example.   8

Unit—II

3. (a) Implement Strassen's matrix multiplication on A and B :   12

$$A = \begin{bmatrix} 5 & 3 & 0 & 2 \\ 4 & 3 & 2 & 6 \\ 7 & 8 & 1 & 4 \\ 9 & 4 & 6 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 & 4 & 7 \\ 2 & 5 & 2 & 9 \\ 3 & 9 & 0 & 3 \\ 7 & 6 & 2 & 1 \end{bmatrix}$$

(b) Explain Quick sort algorithm with example.   8

Or

4. (a) Explain Divide and Conquer technique. Design an algorithm based on this technique for binary search. 8

(b) Write the procedure merge sort and trace the algorithm on the array of 10 elements given below : 12

24, 26, 54, 28, 24, 33, 38

Unit—III

5. (a) Find the optimal schedule for the following jobs with $n = 7$ profits :   10

$(P_1, P_2, P_3, \ldots, P_7) = (3, 5, 18, 20, 6, 1, 38)$

$(d_1, d_2, d_3, \ldots, d_7) = (1, 3, 3, 4, 1, 2, 1)$

(b) Show how to solve fractional knapsack problem in $\theta(n)$ time.   10

Or

6. (a) Explain dynamic programming concept with example. 8

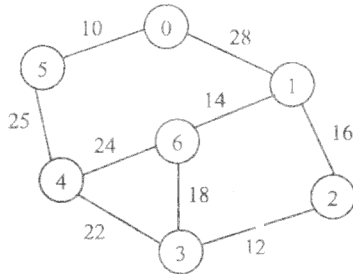(b) Find minimum cost spanning tree for the following graph using Prim's algorithm.   12

Fig. 1

Unit – IV

7. (a) What is travelling salesperson problem ? Using a back-tracking strategy, design an algorithm to solve it.   12

   (b) Explain lower bound theory.   8

Or

8. (a) Solve travelling salesperson problem by using branch and bound technique.   10

   (b) Design a backtracking algorithm for the Hamiltonian cycle.   10

Unit – V

9. (a) Insert the given keys in to an AVL tree : 34 L, 206, 444, 523, 607, 301, 142, 183, 102, 157 and 149.   10

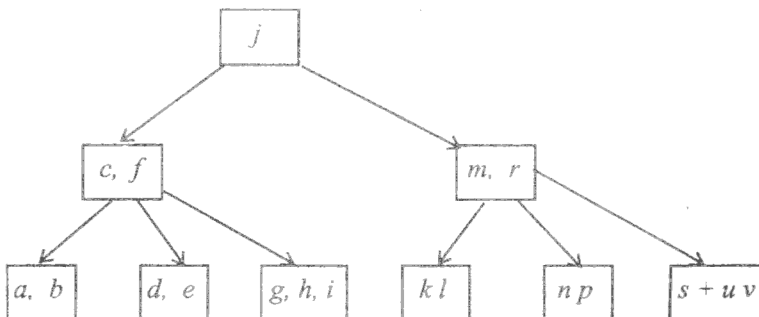   (b) Delete *b, m, n, e, c* in the following B-tree.   10

Fig. 2   P. T. O.

Or

10. Write short notes on the following :   5 ea

    (i)   NP-completeness

    (ii) Binary search tree

    (iii) Height balanced trees

    (iv) Traversal techniques for trees