

ALCCS – NEW SCHEME

Code: CT42
Time: 3 Hours

Subject: DESIGN AND ANALYSIS OF ALGORITHMS
Max. Marks: 100

AUGUST 2011

NOTE:

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

Q.1 **(7 × 4)**

- Explain Priority queues. What data structure is used for its implementation?
- Discuss strongly connected components of a graph with example.
- What do you mean by NP complete and NP hard problem?
- Define Undirected Graph with example.
- What is the difference between Internal sorting and External sorting?
- Define AVL Tree with example.
- Define Binary search tree with example.

Q.2 a. Give the worst case time and the best case time for the following algorithm

“ABC(n)”:

ABC(n)

{ for (i=2 to n/2)

{ if (n % i == 0)

break;

}

}

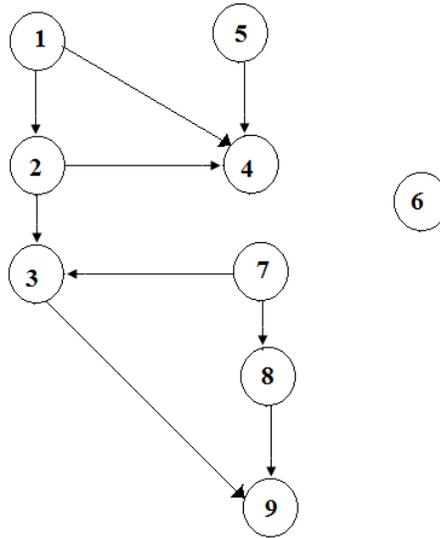
(6)

- What is the running time of Quick Sort when elements of array A have same value? **(4)**
- Illustrate the operation of Bucket Sort on array A. **(8)**
A = (0.79, 0.13, 0.16, 0.64, 0.39)

Q.3 a. Beginning with an empty red black tree insert in succession the following keys **(9)**
(10, 20, 30, 40, 50, 60, 70)

- Augment the above red black tree to support operation on order statistic tree and obtain an element of second rank. Give the algorithm for the same. **(9)**

- Q.4** a. Show the ordering of vertices produced by Topological_Sort when it runs on the following directed acyclic graph: (9)



- b. What is an optimal Huffman code for the following set of frequencies based on first 8 Fibonacci series:
1,1,2,3,5,8,13,21 (9)

- Q.5** a. Compute the connected components of a graph $G = (V,E)$ where
 $V = \{a, b, c, d, e, f, g, h, i, j, k\}$
 and edges E are preprocessed in the following order:
 (d, i) (f, k) (g, i) (b, g) (a, h) (i, j)
 (d, k) (b, j) (d, f) (g, j) (a, e) (i, d)
 Using disjoint set data structure operations. (9)

- b. Show the steps to create the heap that results when the following keys are inserted into an initially empty heap.
41 28 33 15 25 7 12 (9)

- Q.6** a. Suppose that the following character array is to be sorted by the heap sort
ALGORITHMS
 Show how the above data would be arranged in the array after heap construction phase. (9)

- b. Suppose that in 0-1 knapsack problem the order of items when sorted on increasing value is the same as their order when sorted by decreasing weight. Give an efficient algorithm to find an optimal solution to the problem. (9)

- Q.7** Write short notes on any **THREE** of the following:-
 (i) Radix sort
 (ii) B trees
 (iii) Floyd – Warshall Algorithm
 (iv) Robin Karp string matching technique (6×3)