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06CS43

Fourth Semester B.E. Degree Examination, June-July 2009
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions selecting at least TWO from each part.***

PART – A

1 a. With figure, explain algorithm development process. **(10 Marks)**

b. Explain how priority Queue can be implemented as unsorted array. **(06 Marks)**

c. Find GCD (60, 24) by applying Euclid's formula. Estimate the number of times computation is done in Euclid's method and in an algorithm based on checking consecutive integers from min (m, n) down to gcd (m, n). **(04 Marks)**

2 a. Explain all asymptotic notations used in algorithm analysis. **(06 Marks)**

b. Consider the following algorithm

Algorithm Enigma $(A[0..n-1, 0..n-1])$

```
for i ← 0 to n-2 do
    for j ← i + 1 to n-1 do
        if A [i, j] ≠ A [j. i]
            return false
    end for
end for
    return true
end algorithm
```

i) What does this algorithm compute?

ii) What is its basic operation

iii) How many times is the basic operation executed?

iv) What is the efficiency class of this algorithm?

v) Can this algorithm be further imported? **(10 Marks)**

Consider the following recursive algorithm for computing the sum of the first n cubes.

$S(n) = 1^3 + 2^3 + 3^3 + \ldots\ldots + n^3$

Algorithm S (n)

```
if (n = 1) return 1
    else return (S (n-1) + n * n * n)
end algorithm
```

Set up and solve a recurrence relation for the number of times the algorithm's basic operation is executed. **(04 Marks)**

3 a. Write the Quick sort algorithm. Trace the same on data set – 5, 3, 1, 9, 8, 2, 4, 7. **(10 Marks)**

b. Write an algorithm to find the height of Binary tree. **(04 Marks)**

c. Outline an exhaustive search algorithm to solve Travelling salesman problem. **(06 Marks)**

4 a. Consider a set of 13 elements in an array list the elements of array that require the largest number of key comparisons when searched for by Binary search. Find the average number of key comparisons made by binary search in successful search and unsuccessful search in this array. **(06 Marks)**

b. Write depth first search algorithm. **(08 Marks)**

c. Briefly explain how breadth first search can be used to check connectness of a graph and also to find the number of components in a graph. **(06 Marks)**

PART – B

5 a. Design a Presorting – based algorithm to find the distance between the 2 closest numbers in an array of 'n' numbers. Compare the efficiency of this algorithm. With that of brute – force algorithm. **(10 Marks)**

b. Construct AVL tree for the set of elements – 5, 6, 8, 3, 2, 4, 7. **(06 Marks)**

c. Apply Horspool's algorithm to search for the pattern BAOBAB in the text
BESS␣KNEW␣ABOUT␣BAOBABS
Also, find the total number of comparisons made. **(04 Marks)**

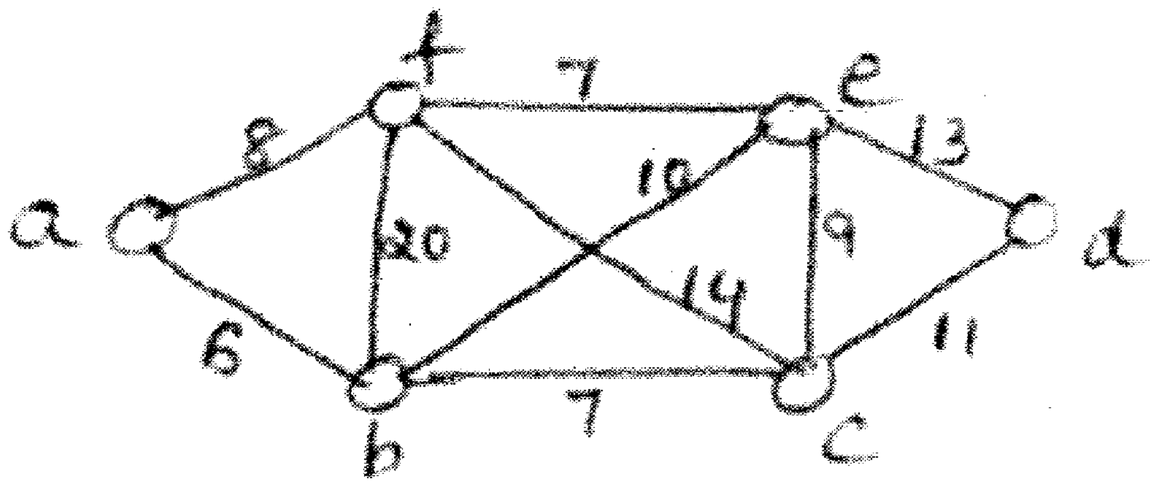
6 a. For the input – 30, 20, 56, 75, 31, 19 construct the open hash table. Find largest and average number of key comparisons in a successful search in the table. **(06 Marks)**

b. Explain Dynamic programming. **(04 Marks)**

c, Write the formula to find the shortest path using Floyd's approach. Use Floyd's method to solve the below all-pairs shortest paths problem. **(10 Marks)**

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

7 a. Use Kruskal's method to find min cost spanning tree for the below graph. **(06 Marks)**



b. Write Huffman tree construction algorithm. **(08 Marks)**

c. Draw the decision tree for the 3 – elements insertion sort. **(06 Marks)**

8 a. Differentiate between back tracking and Branch – and – bound algorithm. **(06 Marks)**

b. Draw the state space tree to generate first solution to 4 – queens problem. With the first solution, generate another solution, making use of board's symmetry. **(08 Marks)**

c. Explain P and NP problems. **(06 Marks)**

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