http://www.aktuonline.com

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1430 Roll No. | | | | | | | | | | |

M.C.A.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2010-11

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** the questions.

(2) All questions carry equal marks.

(3) Make suitable assumptions wherever necessary.

1. Attempt any **FOUR** parts of the following :— **(5×4=20)**

(a) Write the essential characteristics of a good algorithm. Explain big-oh complexity order classification in increasing order of time.

(b) Illustrate the operations of merge sort on the given array A = {3, 41, 52, 26, 38, 57, 9, 49}.

(c) Let f(n) and g(n) be asymptotically nonnegative functions. Using the basic definition of θ notation, prove that max (f(n), g(n)) = θ (f(n) + g(n)).

(d) Give asymptotic upper bound of the recurrence relation T(n) = T(7n/10) + n. Assume that T(n) is constant for $n \leq 2$.

(e) Analyze the quick sort algorithm when all elements of array A have the same value.

http://www.aktuonline.com

(f) Describe any one sorting algorithm that has linear time complexity.

Attempt any **TWO** parts of the following : **(10×2=20)**

(a) What is the difference between the binary search tree property and the min-heap property ? Can the min-heap property be used to print the keys of an n-node tree in sorted order in O(n) time.

(b) Prove that a red black tree with n internal nodes has height at most 2 log (n+1).

(c) What do you mean by augmenting a data structure ? Write the process of augmenting a data structure.

3. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) State the principle of optimality. Find the two problems for which principle of optimality does hold and two problems for which the principle optimality does not hold.

(b) What do you mean by greedy algorithm ? Write greedy algorithm for Huffman code. Show that your algorithm has greedy choice property.

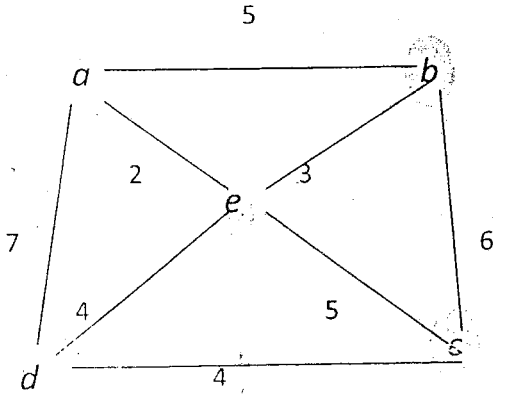
(c) Describe Branch and Bound technique. How the branch and bound technique can be used to solve the 0/1 knapsack problem ?

4. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) Write breadth first traversal algorithm for any graph. Derive its time complexity. How the time complexity of this is different from the time complexity of depth first search algorithm ?

http://www.aktuonline.com

(b) Write the Prim's algorithm for finding the minimum spanning tree of a graph. Using the algorithm find the minimum spanning tree of the following graph. :



(c) Write the Floyd-Warshall algorithm to solve the all-pairs shortest-path problem on a directed graph. Discuss the time complexity of the algorithm.

5. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) Define string matching problem and describe any string matching algorithm with suitable example.

(b) Define the P, NP, NP-complete and NP-hard class problems and give the relationship among these classes.

(c) Write short notes on any *two* of the following :

(i) Randomized algorithms

(ii) Matrix operations

(iii) Approximation algorithms.