15MCSE11

USN 1 M S

M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2016

Course & Branch	:	**M.Tech – Computer Science & Engg.**	**Semester**	: 1
Subject	:	**Advanced Algorithms**	**Max. Marks**	: 100
Subject Code	:	**15MCSE11**	**Duration**	: 3 Hrs

Instructions to the Candidates:

- Answer one full question from each unit.

UNIT – I

1. a) Construct the recursion tree and find the upperbound for the recurrence $T(n) = T(n/3) + T(2n/3) + cn$. (10)

   b) Formally define the following asymptotic notations: (10)
   i. Θ-notation
   ii. O-notation
   iii. Ω notation
   Using the formal definitions of asymptotic notations show that $\frac{1}{2} n^2 - 3n = \Theta(n^2)$. Does it belong to $\Theta(n^3)$? Comment.

2 a) Construct recursion tree and find the upperbound for the recurrence $T(n) = 3T(n/4) + cn^2$. (10)

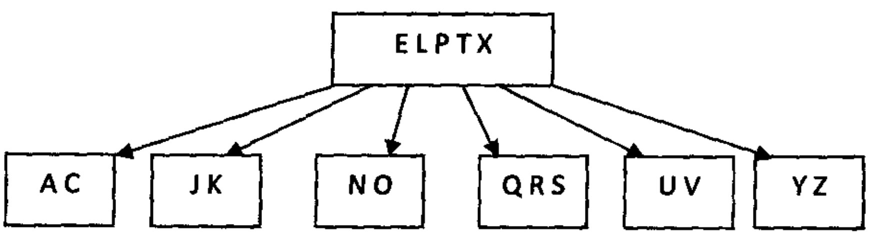
   b) Explain aggregate and accounting methods of amortized analysis for stack operations. (10)

UNIT – II

3. a) Write algorithms for the following operations on a B – tree: (10)
   i. Inserting a key into a B-tree.
   ii. Splitting a node in a B-tree.

   b) What is collision? Given a set of elements: (10)
   {10, 13, 23, 15, 25, 16, 87, 86, 88, 90} and a hash function h(x)= x mod 10. Show the result of inserting the elements into a hash table using:
   i. Separate Chaining
   ii. Closed hashing with quadratic probing as collision resolution strategy
   iii. Closed hashing with linear probing as collision resolution strategy

4. a) Write an algorithm for deleting a key from a B-tree. Show the results of deleting C, P and X in order from the B-tree shown below: (10)



b) Explain the properties of extendible hashing. Show the result of inserting the elements from 0000 to 1111 in the order into an empty extendible hash table data structure. (10)

UNIT – III

5. a) Define Division theorem. (04)
   b) Write the extended-Euclid algorithm to compute GCD of two non negative numbers. Illustrate the execution of the algorithm for GCD(99, 78). (06)
   c) Write an algorithm that prints all solutions to the equation $ax \equiv b \pmod{n}$. Using the algorithm find all solutions of the equation $14x \equiv 30 \pmod{100}$. (10)

6. a) Explain the four cases that occur in BINOMIAL-HEAP-UNION. Write an algorithm to unite two binomial Heaps H1 and H2. (10)
   b) Explain the properties of heaps. Explain how priority queue operations can be implemented using heaps with an example. (10)

UNIT – IV

7. a) Write the navie string matching algorithm. Find the number of occurrences of the pattern $P = aab$ in the given text $T = acaabc$. (10)
   b) State and explain the Rabin Karp string matching algorithm. (10)

8. a) Write the Knuth-Morris-Pratt (KMP-MATCHER) algorithm for string matching and analyze the running time of the algorithm. (10)
   b) Write the Boyer-Moore algorithm for string matching. Find the occurrences of the pattern $P = aab$ in the given text $T = acaabc$ by applying Boyer-Moore algorithm. (10)

UNIT – V

9. Explain the following puzzles with an example for each: (20)
   Magic Square n-queens

10. Explain the following problems with an example for each: (20)
    i) Palindrome counting
    ii) Inverting a Coin Triangle

****