CSE/T/212/18/12(S)

BACHELOR OF COMP. SC. & ENGG. SUPPLEMENTARY EXAMINATION, 2012

(2nd Year, 1st Semester)

DATA STRUCTURES AND ALGORITHMS

Time : Three hours **Full Marks : 100**

Answer question no. 1 and any *four* from the rest.

1. (a) Here is an array with exactly 15 elements:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Find out the elements, which will be found by examining two or fewer numbers using binary search.

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(b) Draw a hash table with open addressing and a size of 11. Use the "modulo 11" hash function to insert the following keys in the given order into your table:
7, 24, 0, 29, 22, 9, 33.

3

(c) Show that $10\,n^2 + 4\,n + 10 = O(n^2)$.

4

(d) Find the new heap created by removing the first item from the following heap:
910 77 66 68 1 3 11.

2

(e) Show how the following expression can be converted to postfix notation:
x + y * 5 / (2 + z) – 3*(x - z) – p $,
where $ is the sentinel. Hence evaluate the postfix expression with the following values of the variables: x=20, y=4, z=2, p=1.

5

(f) A sparse matrix is represented by the following triples; find the original matrix:
(5, 4, 5), (1, 3, -4), (2, 1, 2), (2, 4, 10), (4, 2, 50), (4, 5, 29).

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2. Explain the Queue ADT. Discuss in detail the implementation of such a Queue data structure using array.

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3. Develop the idea of implementation of single-linked list using an array and cursor. Clearly explain and develop the algorithms for initializing such an array, initializing a linked list and inserting an element at the front of an existing list.

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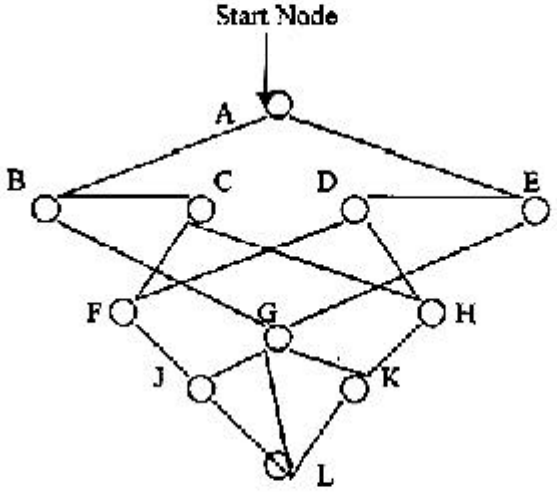
4. Write a C program to accept two integers from the user and to find and print the Greatest Common Divisor of the two numbers. Your program should take care of all possible bad inputs from the user.
Write the approach you have taken to develop the above algorithm and find out the time complexity of your program.

12 + 8

5. What are the different kinds of Recursion? Write a recursive algorithm for Depth First Search of a Graph. Convert the algorithm to an iterative one. Show the contents of the stack after each iteration for the following graph:

$6 - 4 + 6 + 4$



6. Explain the algorithm of Selection sort with an example of six unsorted numbers. Compute the Time Complexity of Selection Sort Algorithm. In what cases, Selection Sort is worse than Insertion Sort? Explain.

$10 + 6 + 4$

7. Define the ADT Stack. Implement it using a pointer-based single-linked list.

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