INTER ENGG. (COMP. SC. & ENGG.) EXAMINATION, 2005

(1st Semester)

DATA STRUCTURES AND ALGORITHMS

Time : Three hours Full Marks : 100

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

1. (a) Find the new heap created by removing the first item from the following heap:
650 88 55 68 1 3 11. 2

(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

(d) Explain with examples, in which cases a recursive function will not terminate. 4

(e) Show how the following polynomial can be efficiently represented:
$15x^{90} - 10x^{12} + x^2 - 20$ 2

(f) 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=l. 5

(g) What do you mean by a Transitive C'osure Matrix? Explain with an example. 4

2. Define the ADT Queue. Implement the Queue Data Structure using pointers in C. 20

3. What are the uses of the stack data structure? Explain how recursive subroutines can be implemented using stack.

State and explain with a simple example how you can use a stack for converting an infix expression to the postfix notation. 10+10

4. What are the problems of Binary Search Tree? Explain the improvement of performance by the use of Height Balanced Tree.
Explain how a height–balanced tree can be formed by inserting the following elements in the
given order:
1,2,3,4,5,6,8,9,10,7,11.
Show how the root element can be deleted from the above tree. 6 + 10 + 4

contd.

5. Explain the rationale of Quicksort. Why does the algorithm perform so fast? What are the cases when the Quicksort algorithm behaves like a slow sort? What is the effect of the choice of pivots on the performance of Quicksort algorithm?

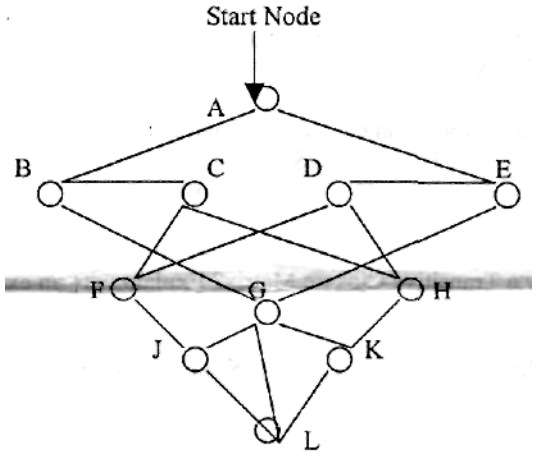
   Describe the algorithm of Quicksort and explain its working with the help of the following input array:

   23,4,55,6,66,7,77,8,88,90.

   10+ 10

6. What is a Graph? How is it represented as a data structure?
   Write an algorithm for Breadth First Search of a Graph. Show how the algorithm works on the following graph:

   20



7. What are the problems of Binary Search Tree? Explain the improvement of performance by the use of Height Balanced Tree.
   Explain how a height – balanced tree can be formed by inserting the following elements in the given order:

   4, 5, 7, 2, 1, 3, 6, 15, 10.

   Show how the root element can be deleted from the above tree.

   20

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