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**Third Semester B.E. Degree Examination, May/June 2010**  
**Data Structures with C**

Time: 3 hrs.

Max. Marks:100

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

**PART - A**

- 1
  - a. What is a pointer? What are the uses of pointers in C? (05 Marks)
  - b. Explain what is meant by lvalue and rvalue, with examples. (05 Marks)
  - c. Write a C program to read ten integers and store them in an array using pointers. Print their sum and average. (10 Marks)
  
- 2
  - a. What is a string? How is a string declared and initialized? (05 Marks)
  - b. Write appropriate structure definition and variable declarations to store following information about 100 students:  
 Name, USN, Gender, Date of birth and marks in three subjects S<sub>1</sub>, S<sub>2</sub> & S<sub>3</sub>.  
 Date of birth should be a structure containing fields day, month and year. (05 Marks)
  - c. Write a function that given a binary file, copies the odd items (item 1,3,5,...n) to a second binary file and the even items(item, 2,4,6,8,...n+1) to a third binary file. (10 Marks)
  
- 3
  - a. Define stack. Briefly explain the primitive operations on the stack. (05 Marks)
  - b. Show using the tabular columns, how the expression (A+B)\*C is converted into a postfix expression according to the infix to postfix conversion algorithm. (05 Marks)
  - c. Write the algorithm to evaluate a valid postfix expression and hence evaluate the postfix expression :  

$$6 \ 2 \ 3 \ + \ - \ 3 \ 8 \ 2 \ / \ + \ *$$
 All the operands are single digit positive integers and operators are binary in nature. (10 Marks)
  
- 4
  - a. Determine what the following recursive C function computes:  

```

int func(int n)
{
    if (n == 0)
        return(0);
    return(n + func(n - 1));
} /* end of func */

```

 Write an iterative function to accomplish the same. (05 Marks)
  - b. Explain the working of a simple queue. (05 Marks)
  - c. Write a recursive function fact(n) to find the factorial of an integer. Diagrammatically explain, how the stacking and unstacking takes place during execution for fact(4). (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**PART - B**

- 5 a. What is a linear linked list? Write the algorithm to add an element to the front of the list. (05 Marks)
- b. What are the advantages and disadvantages of representing a group of items as an array versus linear linked list? (05 Marks)
- c. Write the following C routines for the dynamic implementation of a linked list. NODEPTR is of type pointer to a node.
- void insertafter(NODEPTR p, int x) which inserts a node with information x after a node pointed to by p.
  - void place(NODEPTR \*plist, int x) which inserts a node with information x at a proper position within the linear linked list pointed to by \*plist. The list is assumed to contain information in the increasing order. (10 Marks)
- 6 a. What is a circular list? Explain with a diagram. (05 Marks)
- b. Compare linear linked list and doubly linked list, with diagrams. (05 Marks)
- c. Give the C implementation of stack as circular list. (10 Marks)
- 7 a. With reference to the b-tree in Fig.Q7(a), give the three traversals (05 Marks)

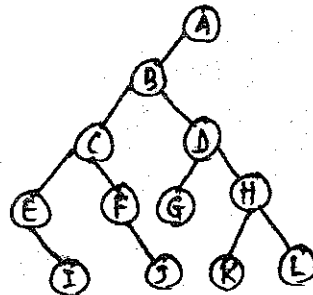


Fig.Q7(a)

- b. i) Define strictly binary tree. Is the tree in Fig.Q7(a), a strictly b-tree.
- ii) Define almost-complete b-tree. Is the tree in Fig.Q7(a), an almost complete b-tree. (05 Marks)
- c. With reference to the dynamic node representation of b-tree, write the following C routines:
- NODEPTR maketree(int x) which creates a node with information x.
  - Void setleft(NODEPTR, int x) which sets a node with contents x as the left son of the node pointed to by p. (10 Marks)
- 8 a. With an example, show how a list can be represented as binary tree. (05 Marks)
- b. Define the following terms with reference to general trees:  
Father, son, brother, forest and ordered tree. (05 Marks)
- c. Give the node structure of an expression tree. Explain how the expression is evaluated. (10 Marks)

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