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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 S₁, S₂ & S₃.
 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)

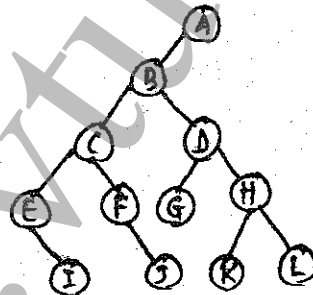


Fig.Q7(a)

- 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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Third Semester B.E. Degree Examination, December 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? How do you declare and initialize the pointers? How do you access the value pointed to by a pointer? (05 Marks)
 - b. What is static and dynamic memory allocation? Explain with examples, the dynamic memory allocation functions. (10 Marks)
 - c. What is the output of the following code?


```
int num[5] = { 3, 4, 6, 2, 1 };
int *p = num;
int *q = num + 2;
int *r = &num[1];
Printf(“%d %d”, num[2], *(num + 2));
Printf(“%d %d”, *p, *(p + 1));
Printf(“%d %d”, *q, *(q + 1));
Printf(“%d %d”, *r, *(r + 1));
```

 (05 Marks)
2.
 - a. Explain the following string functions, with examples:
 - i) STRTOK ii) STRCMP iii) STRTOL iv) STRSTR
 (12 Marks)
 - b. Write a C program to represent a complex number, using structure and multiply 2 complex numbers. (08 Marks)
3.
 - a. Define stack. List the operations on stack. Write the C implementation of these operations. (12 Marks)
 - b. Implement reversing a string, using a stack in C. (08 Marks)
4.
 - a. Write an algorithm for evaluating a valid postfix expression. Trace the same on
 1 2 3 + * 3 2 1 - + * (10 Marks)
 - b. What is the advantage of circular queue over linear queue? Write C routines for inserting and deleting an element from the circular queue. (10 Marks)

PART – B

5.
 - a. What is recursion? Write recursion function for finding maximum of n numbers. (08 Marks)
 - b. Briefly explain the structures of different types of linked lists. Write a C function to count number of elements present in a singly linked list. (12 Marks)

- 6 a. How can an ordinary queue be represented, using a singly linked list? Write C functions for linked implementation of ordinary queue insertion and deletion. (10 Marks)
- b. Write a C program to perform the following operations on doubly linked list:
- i) Insert a node
 - ii) Delete a node. (10 Marks)
- 7 a. What are binary trees? Mention different types of binary trees and explain briefly. (06 Marks)
- b. Write C functions for the following tree traversals:
- i) Inorder
 - ii) Preorder
 - iii) Postorder. (06 Marks)
- c. Write an algorithm to construct a binary tree for the inputs
14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5
indicating a message for duplicate members. Draw the tree constructed by the above program. (08 Marks)
- 8 Write short notes on:
- a. Unions
 - b. Circular lists
 - c. Threaded binary tree
 - d. Types of files. (20 Marks)
