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10CS35

Third Semester B.E. Degree Examination, Aug./Sept. 2020
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? Write the output of the following program.

```
void main ( )
{
   int a, b, x, y, *ptr1, *ptr2 ;
   a = 30, b = 6 ;
   ptr1 = &a; ptr2 = &b;
   x = *ptr1 + *ptr2 – 6 ;
   y = 6 – *ptr1/*ptr2 + 30 ;
   printf ("\n a = %d, b = %d", a, b);
   printf ("\n x = %d, y = %d", x, y) ;
   *ptr1 = *ptr1 + 70 ;
   *ptr2 = *ptr2 * 2 ;
   printf ("\n a = %d, b = %d", a, b) ;
   *ptr1= *ptr1 + * ptr2 ;
   printf ("\n a = %d, b = %d", a, b) ;
}
```
(06 Marks)

b. The factorial faction n! has value 1 when n ≤ 1 and value n*(n – 1)! When n > 1. Write both a recursive and an iterative C function to compute n!. Determine the space complexity of both the functions. **(06 Marks)**

c. Define Recursion. Write a recursive function that print out the sequence of moves and the number of moves needed to solve the "Tower of Hanoi" problem. **(08 Marks)**

2 a. Define structures. Write a C program to illustrate the definition of a structure, declaration of a structure variable and referencing of a member of the declared structure variables with comments. **(10 Marks)**

b. Define sparse matrix. What are the advantages of sparse matrix representation? Write a function in C to transpose a given matrix represented as triples in a single dimensional array. **(10 Marks)**

3 a. Define stack data structure and write the functions in C for performing PUSH, POP and DISPLAY operations on stack. **(08 Marks)**

b. Write the postfix and prefix expression for (a + b) *d + e/(f + a * d)+c **(06 Marks)**

c. Write C functions to implement operations for inserting and deleting elements from the circular queue. **(06 Marks)**

4 a. What is a linked list? Write a C program to simulate Queues using single linked lists. **(10 Marks)**

b. Illustrate how polynomials are represented using linked lists with an example. Write a C function to add two polynomials. **(10 Marks)**

PART – B

5 a. Write a C function that counts the number of leaf nodes in binary tree. **(04 Marks)**

b. Write the in-order, pre-order and post-order traversals for the binary tree shown in Fig Q5(b).

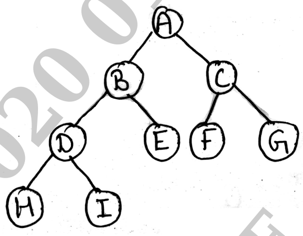

Fig Q5(b) **(06 Marks)**

c. Suppose that we have the following key values :
7, 16, 49, 82, 5, 31, 6, 2, 44
i) Write out the max heap after each value is inserted into the heap
ii) Write out the min heap after each value is inserted into the heap. **(10 Marks)**

6 a. What is a binary search tree? Write a C function to insert elements into the binary search tree. **(08 Marks)**

b. Construct the binary search tree for the following input : **(04 Marks)**
100, 75, 150, 125, 200, 175, 25, 50, 35, 72, 137.

c. For the digraph of Fig Q6(c). obtain
i) the in-degree and out-degree of each vertex
ii) its adjacency matrix
iii) its adjacency – list representation.

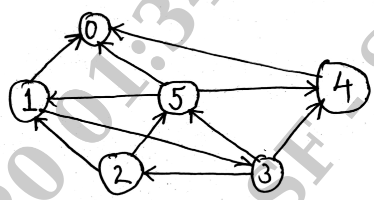

Fig Q6(c) **(08 Marks)**

7 a. What are the various types of priority queues? Explain each with its operations. **(08 Marks)**

b. Explain Height-based leftist tree and weight – based leftist tree with examples. **(06 Marks)**

c. Define Binomial heap and Fibonacci heap, illustrate with examples. **(06 Marks)**

8 a. Construct an AVL tree by inserting the elements in the order 50, 100, 150, 125, 190, 35 and 20 starting from an empty tree. Demonstrate the rotations done during constructing the AVL tree wherever applicable. **(12 Marks)**

b. What is a splay tree? What are the advantages of splay trees? **(08 Marks)**

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