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1781

Your Roll No.

B.Sc. (H) COMPUTER SCIENCE/II Sem. A

Paper-201 : DATA STRUCTURE

(Admissions of 2001 and onwards)

Time : 3 Hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt all questions.

Attempt all the parts of a question together.

All the code has to be written in C++.

1. (a) Give a class definition of Stack. Write a program that uses this stack to determine if an input character string is of the form
$$x C y$$
where x is a string consisting of the letter 'A' and 'B' and y is the reverse of x. At each point you may read only the next character of the string. 3+5
- (b) What are priority queues ? Write member functions enqueue and dequeue for ascending priority queues. 6
2. (a) Write a recursive function to compute the maximum element of an integer array. 4

[P.T.O.]

(b) Given

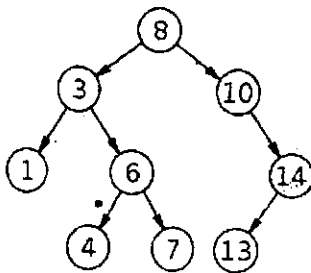
$$C(n, 1) = n$$

$$C(n, n) = 1$$

$$C(n, k) = C(n-1, k) + C(n-1, k-1)$$

Find the value of $C(5, 2)$. 4

3. (a) Write a member function of class singly linked list that deletes a given element from the list. Throw an exception if the element is not present in the list. 5
- (b) Write a member function of doubly linked list that gives the middle element of the list by traversing the list only once. 5
4. (a) What is a binary search tree? Write a function that inserts a given element in a Binary search tree. If the element is already present throw an exception "Duplicate Value". 5
- (b) Give the preorder, in order and postorder traversals for the following tree 3



- (c) Write a function that counts the total number of nodes in a Binary tree. 4
5. (a) What are generic functions? How are they implemented in C++? Give a generic function swap that swaps two variables of type X. 4
- (b) What is runtime polymorphism? Illustrate with an example. 4
6. (a) How are multiple catch blocks defined? What will happen if an exception is thrown for which no matching catch block is defined? 3
- (b) What is multiple inheritance? How is that implemented in C++? Illustrate with the help of an example. 4
7. (a) A lower triangular matrix is an $n \times n$ array in which $A(i,j)=0$ if $i < j$. How can these elements be stored sequentially in one dimensional array? Design a class `lower_matrix` and define store and retrieve function. 6
- (b) What are copy constructors? When are they invoked? Explain with the help of an example. 4
8. Give output of the following code segments:
- (a) 3+3
`#include <iostream>`

```

using namespace std;
class Y
{ public: int i;
      Y() { cout << "constructing Y \n"; }
      ~Y(){ cout << "destructing Y \n"; } }
void f(Y y2)
{ y2.i = y2.i + 10;
  cout << y2.i << "\n"; }
}
int main()
{ Y y1();
  y1.i=5;
  cout<< "the value of i is "<< y1.i;
  f(y1);
  cout << "the value of i is "<< y1.i; return 0;}
}
(b) void xyz(char *t)
{
  if (*t=='\0') return;
  xyz(t+ 1);
  cout<<*t;
}
void main()
{ char *t= "abcdef";
  xyz(t);
}

```