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EASTERN UNIVERSITY, SRI LANKA
SECOND EXAMINATION IN SCIENCE 2001/2002
FIRST SEMESTER (April/May, 2002)
(Repeat)

CS 201 - Data Structures & Design of Algorithms

Answer All Questions

Time: 2 Hours

Q1

(a) Explain, with the aid of real world problems, the concept of recursion.

(b)

(i) Write a *recursive* function to find the n^{th} Fibonacci number.

The n^{th} Fibonacci number is calculated using the recurrence relation: $f(n)=f(n-2)+f(n-1)$, $n>2$. Where n is a positive integer and $f(1)=f(2)=1$.

(ii) What is the output of the following program when the values of n are 0, 5, and -5?

```
#include<iostream.h>
#include<conio.h>

void f(int n)
{
    if (n==0)
        cout<<endl<<n;
    else if(n>0)
    {
        cout<<endl<<n;
        f(n-1);
    }
    else
    {
        f(n+1);
        cout<<endl<<n;
    }
}
```

```

void main()
{
    clrscr();
    int n;
    cout<<endl<<"Enter an integer number:";
    cin>>n;
    f(n);
}

```

Q2

Write a recursive *Binary search* algorithm to search an element in a sorted array.

Trace the above searching algorithm for the following search element , s:

- (i) s= 7
- (ii) s= 15
- (iii) s=-6
- (iv) s=5
- (v) s=25

in the array, **A:**

-5	-1	1	4	6	7	9	12	15
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Q3

Define and implement *ADT Stack* and *ADT Queue* data structures. Use linked list to represent the list of elements.

Write a C++ program that reads an integer number and verify whether the input number is a palindrome using stack and queue data structures defined above.

Q4

(a) Describe *Bubblesort* and *Mergesort* algorithms to sort a list of numbers.

Trace the above sorting algorithms for the following list of numbers:

- (a) 1, 1, 1, 1, 1, 1
- (b) 1, 2, 3, 4, 5, 6
- (c) 9, 8, 7, 6, 5, 4
- (d) 5, 8, 3, 7, 1, 2

and compare them.