



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY

Academic Year 2011/2012 – 2nd Year Examination – Semester 4

IT4104: Programming II
PART 2 - Structured Question Paper

21st July, 2012
(ONE HOUR)

To be completed by the candidate

BIT Examination Index No:

Important Instructions:

- The duration of the paper is **1 (one) hour**.
- The medium of instruction and questions is English.
- This paper has **2 questions** and **6 pages**.
- **Answer both questions. Questions do not carry equal marks. (60% and 40%)**
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
If a page is not printed, please inform the supervisor immediately.

Questions Answered

Indicate by a cross (X), (e.g. ☐) the numbers of the questions answered.

To be completed by the candidate by marking a cross (X).	Question Numbers		
	1	2	
To be completed by the examiners:			

1)

a) Write a segment of a Java program to illustrate a node of a binary search tree.

(28 Marks)

ANSWER IN THIS BOX

```
public class IntBSTNode{
```

```
    int key;
```

```
    protected IntBSTNode left, right;
```

```
    public IntBSTNode{
```

```
        left = right = null;
```

```
    }
```

```
    public IntBSTNode (int el){
```

```
        this(el,null,null)
```

```
    }
```

```
    public IntBSTNode(int el, IntBSTNode lt, IntBSTNode rt) {
```

```
        key = el;
```

```
        left = lt;
```

```
        right = rt;
```

```
    }
```

```
}
```

- b) Linked list can be used to overcome some of the limitations imposed by arrays. Briefly discuss three of them in short.

(12 marks)

ANSWER IN THIS BOX

Arrays size cannot be changed dynamically

Changing the size of the arrays require creating a new array and then copying all data from the array with the new size

The data in the array are next to each other sequentially in memory, which means that inserting an item inside the array requires shifting some other data in this array.

Etc....

c) Write the pseudo code of the selection sort algorithm.

(20 marks)

ANSWER IN THIS BOX

selectionSort(data[])

for i = 0 to data.length - 2

select the smallest among data[i].....data[data.length - 1]

swap it with data[i];

2)

- a) The factorial of a non-negative integer n , denoted by $n!$, is the product of all positive integers less than or equal to n . For example,

$$5! = 5 * 4 * 3 * 2 * 1 = 120$$

The value of $0!$ is 1, according to the convention for an empty product.

The factorial function is recursively defined by:

$$n! = \begin{cases} 1 & \text{if } n = 0, \\ (n-1)! \times n & \text{if } n > 0. \end{cases}$$

Write a Java program to implement the factorial evaluation, to illustrate the recursive approach. (20 Marks)

ANSWER IN THIS BOX

```
int factorial (int i){
```

```
    If( n == 0 )
```

```
        return 1;
```

```
    else
```

```
        Return n * factorial ( n -1 );
```

```
    }
```

b) Explain tail recursion in short.

(20 Marks)

ANSWER IN THIS BOX

```
void tail( int I ) {
```

```
    If ( i > 0){
```

```
        System.out.println(i + "");
```

```
        tail(i - 1);
```

```
    }
```

Tail recursion is characterized by the use of only one recursive call the very end of a method the implementation. In other words when the call is made there are no statements left to be executed by method. The recursive call is not only the last statement but there are no earlier recursive calls
