UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY

Academic Year 2010/2011 – 2nd Year Examination – Semester 4

IT4104: Programming II

PART 2 - Structured Question Paper

6th August 2011

(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 **8 pages**.
- **Answer both questions. Questions do not carry equal marks.**
- **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 (×), (e.g. [X]) the numbers of the questions answered.

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

1)

a) Discuss in short the differences between Binary Trees and Binary Search Trees. (12 Marks)

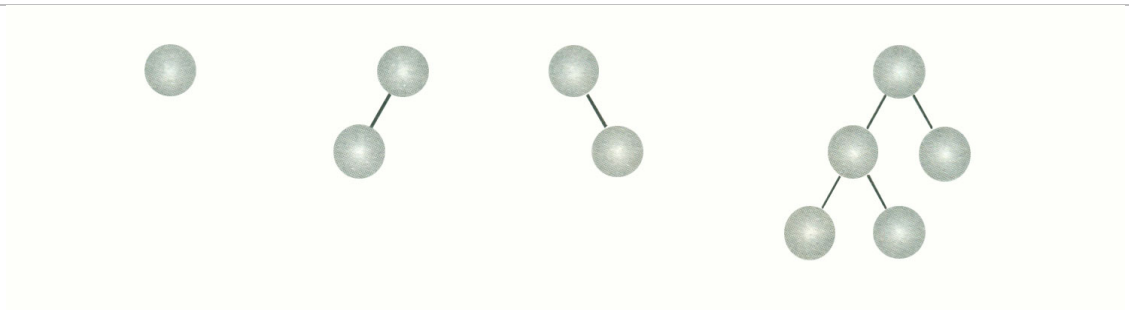
ANSWER IN THIS BOX

The binary search tree also called ordered binary tree has the following property. For each node n of the tree all values stored in its left subtree (the tree whose root is the left child)

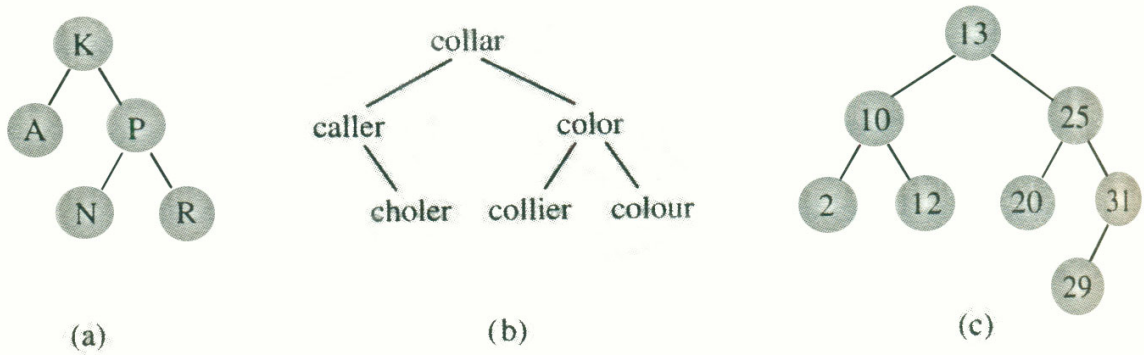
are less than the value v stored in n, and all values stored in the right subtree are greater than v.

Examples of binary trees and binary search trees

Examples of binary trees



Examples of Binaray search trees



b) Write segments of codes in Java to implement four (04) major functions which can be seen in a Stack data structure.

(28 marks)

ANSWER IN THIS BOX

i)

```
public void push(char j)
{
stackArray[++top] = j;
}
```

The method is used to push an element into a stack data structure which is implemented as an array

StackArray[] is the name of the array and top is a variable which is used to indicate the

top of the array. j is an intermediate variable which is passing a value to the instance variable to the array. Then the value of top get increased indicating the stack is getting filled.

ii)

```
public char pop()
{
return stackArray[top--];
}
```

This method is used to take a one element from the array in LIFO access mechanism. The stack has

been implemented as an array having the name stackArray. There is a variable having the name top

and each element is taken out from the array stack.

iii)

```
public boolean isEmpty()
{
return (top == -1);
}
```

The method is used to check to see whether the array is empty. If the value of top has gone beyond 0 (that means -1) then it says that the stack is empty. Then the method outputs a boolean output.

iv)

```
public char peek()
{
return stackArray[top];
}
```

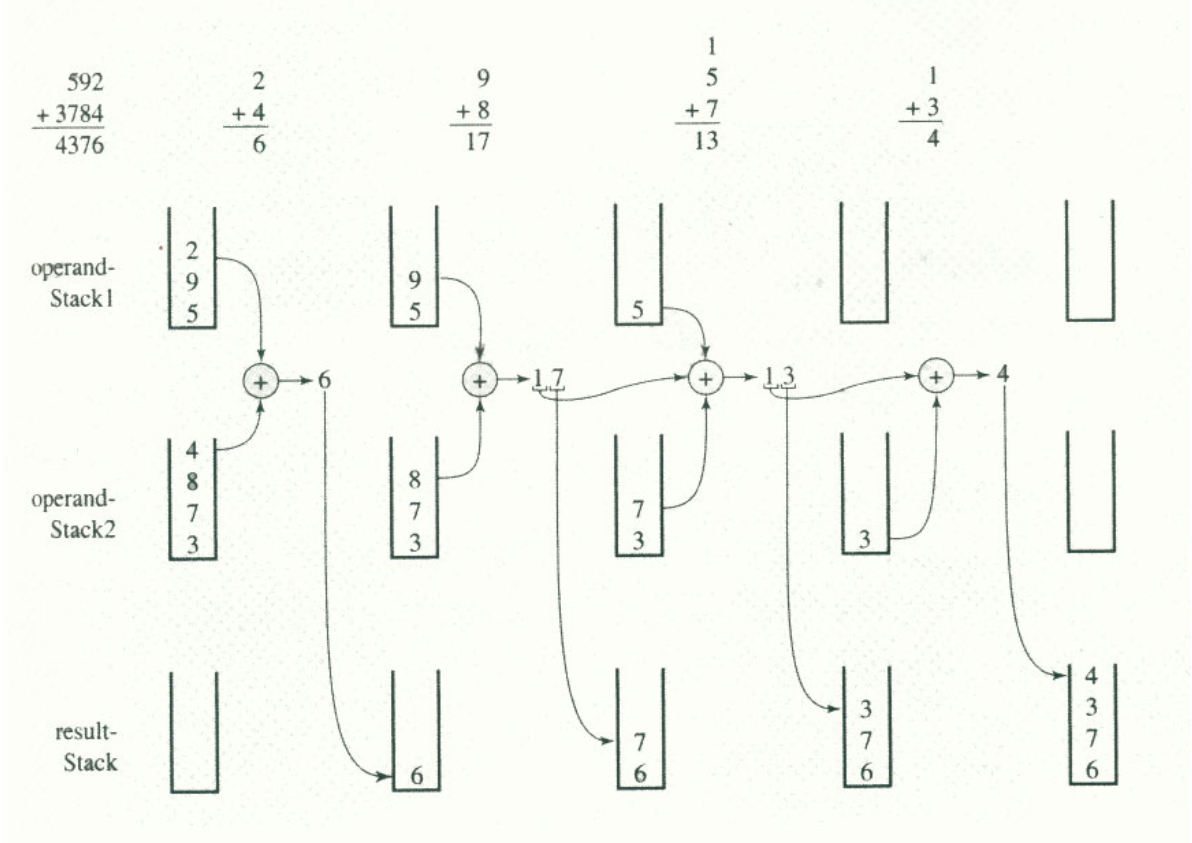
The peek method is used to check the top most value in the stack at a particular time.

Note: other than those methods written, any other important methods are accepted. But pop and push methods has a significant role here so they are very important.

c) Illustrate diagrammatically how to use set of stack data structures to add the following 2 numbers.

592
3784 (20 marks)

ANSWER IN THIS BOX



2) a) Explain a Heap in short by using a diagram. (20 marks)

ANSWER IN THIS BOX

A particular kind of a binary tree, called a heap has the following two properties.

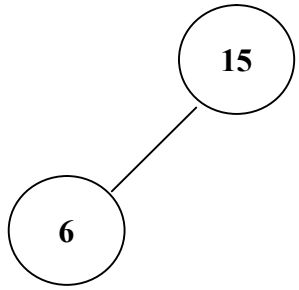
1. the value of each node is greater than or equal to the values stored in each of its children

2.the tree is perfectly balanced, and the leaves in the last level are all in the leftmost position

To be exact these two properties define a max heap. If one say the first property in the following way (1. the value of each node is less than or equal to the values stored in each of its children)

then it will become a min heap that means the definition defines a min heap. That means root of a a max heap contains a largest element, whereas the root of a min heap contains the smallest.

A heap is an excellent way to implement a priority queue.



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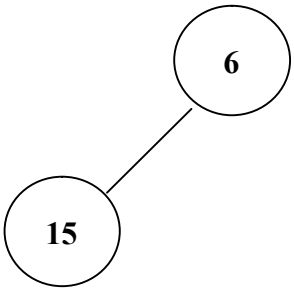

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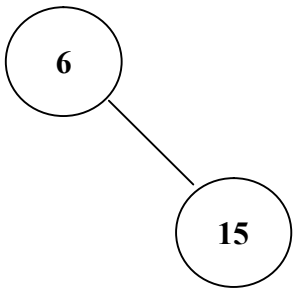

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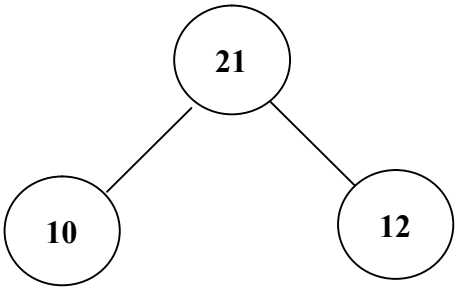

From the above diagrams one can consider digrams A and D as heaps.

b) Explain a priority queue data structure in short.

(20 Marks)

ANSWER IN THIS BOX

In many situations simple queues are inadequate, as when first in first out scheduing has to be overruled using some priority criterial.

If one consider a post office, a handicapped person may have priority over others.

In a sequence of a processes process p1 may need to to executed before process p2 for the proper functioning of a system, eventhough p1 was put on the queue of waiting processes before p2.

In a situation like these, a midified queue, or priority queue is needed.

In a priority queue elements are dequeued according to their priority.

The problem with the priority queue is in finding an efficient implementation that allows relatively

fast enqueuing and dequeuing. Because elements may arrive randomly to the queue. At the same time the element put at the end will be the last candidate for dequeuing.

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