



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2017 – 2nd Year Examination – Semester 4

IT4105 – Programming II
Part 1 - Multiple Choice Question Paper
18th November, 2017
(ONE HOUR)

Important Instructions :

- The duration of the paper is **1 (one) hour**.
- The medium of instruction and questions is English.
- The paper has **25 questions** and **10 pages**.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with **one or more** correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from 0 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper.
If a page is not printed, please inform the supervisor immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

- 1) Suppose we have an array implementation of the queue class, with an array (named as data[]) indexed from 0 to 9. Entries from data[5] to data[8] are empty. All other locations are filled. Where does the *enqueue* method place the new entry in the array?

(a) data[9]	(b) data[10]	(c) data[0]
(d) data[5]	(e) data[7]	

- 2) Consider the following expression.

$$2 + 3 * (100 / 3 + (111 + 2) * [120 + \{100 + 1\} + \{20 + 1 * [20 * 10 + 1]\} + 10] +) + 1)$$

Assume that a stack is used to check for “*Matching Parentheses*” in the above expression. What is the maximum number of tokens that will appear in the stack during the “*Matching Parentheses*” process of this expression?

(a) 1	(b) 2	(c) 3
(d) 4	(e) 5	

- 3) Structure of a list node used for linked list implementation is as follow

```
Class node{
    int value = null;
    node next = null;
}
```

Assume that a list with elements 5, 4, 3, 2, 1 is needed to create the above nodes. What are the commands that are not necessary for that operation?

Following lines are already being executed.

L = new node(); //L is the variable pointed to the start of the linked list.

L.value=5;

(a) L.next = new node();
(b) L.next.next.next.value = 1;
(c) L.next.value = 4;
(d) L.next.next = new node();
(e) L.next.value = new node();

- 4) Hand execute (dry run) the following pseudo code segment and show the contents of the resulting queue.

```
values = Queue ()
for (int i=5;i<10;i++)
{
    for (int j=2;j<5;j++)
    {
        if (i % j == 0 )
            values.dequeue()
        else
            values.enqueue( i )
    }
}
```

- (a) 9,9,9
(b) 7,7,8,9,9
(c) 5,6,7,7,8,9,9,9
(d) 7, 8, 9, 9 ,9
(e) 8, 8, 9, 8, 8

- 5) Hand execute (dry run) the following pseudo code segment.

```
s = stack();
q = queue();
for(i = 0; i < 10; i++)
    if(i % 2 != 0){
        s.push(i)
    }else{
        q.enqueue(i)
    }
}
while(!s.isEmpty()){
    q.enqueue(s.pop());
}
```

The contents of the queue are,

- | | |
|------------------------------------|------------------------------------|
| (a) [7, 5, 3, 1, 0, 2, 4, 6, 8, 9] | (b) [1, 3, 5, 7, 9, 8, 6, 4, 2, 0] |
| (c) [0, 2, 4, 6, 8, 9, 7, 5, 3, 1] | (d) [0, 2, 4, 6, 8, 1, 3, 5, 7, 9] |
| (e) [0, 2, 4, 7, 5, 6, 8, 9, 3, 1] | |

6) Consider the following linked list.



Choose the correct code segment(s) that can remove both b and c nodes.

- | | |
|--------------------------|---|
| (a) a.next = a.next.next | (b) a.next = a.next.next.next |
| (c) a = a.next | (d) a.next = a.next.next a.next = a.next.next |
| (e) a.next.next = null | |

7) Before calling pop () in a stack, what condition(s) should be checked?

- | | | |
|-----------------------|--------------------------------|----------------------|
| (a) Overflow | (b) Underflow | (c) Maximum elements |
| (d) Existing Elements | (e) Previously Entered Element | |

8) Which of the following statement(s) is/are **false**?

- | |
|--|
| (a) Arrays are static data structures. |
| (b) Data elements in linked lists do not need to be stored in adjacent space in memory. |
| (c) Memory used in an array and a link list to store any given number of values, are the same |
| (d) Linked lists are a collection of nodes that contain the information part and a reference to the next node. |
| (e) Only arrays can be used to implement stacks. |

9) Consider the following Program.

```
public static long abc(int n) {  
    if (n == 1) return 1;  
    return n * abc(n-1);  
}  
abc(5)
```

What would be the final return value of the above program?

- | | | |
|--------|---------|---------|
| (a) 20 | (b) 60 | (c) 240 |
| (d) 5 | (e) 120 | |

- 10) Consider the following pseudo code algorithm which can be used to find GCD (Greatest Common Divisor) of two numbers using Euclid's Algorithm.

Algorithm is as follows :

```
function gcd(a, b)  
    if b = 0  
        return a  
    else  
        return gcd(b, a % b)  
gcd(54,6)
```

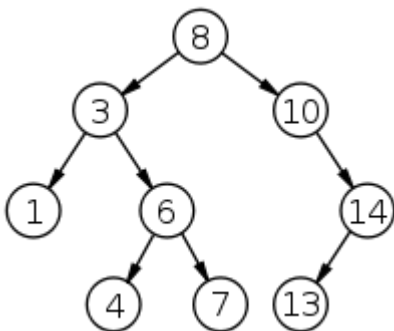
If one does a dry run of the above pseudo code algorithm, what would be the return value?

- | | | |
|-------|-------------|--------------|
| (a) 1 | (b) 2 | (c) 6 and 54 |
| (d) 6 | (e) 3 or 27 | |

- 11) Suppose a binary tree is constructed with n nodes, such that each node has exactly either zero or two children. The maximum height of the tree will be?

- | | | |
|------------|-------------------|---------------|
| (a) $2n$ | (b) $n^2 - 1$ | (c) $(n-1)/2$ |
| (d) $2n+1$ | (e) $n \log(n+1)$ | |

- 12) Consider the following Binary Search Tree.



Suggest (a) suitable node(s) as the replacing node(s), if one wants to delete the node with the key value 8 from the above binary search tree.

- | | | |
|-------|--------|--------|
| (a) 3 | (b) 10 | (c) 13 |
| (d) 6 | (e) 7 | |

13) Consider the following incomplete sentence.

A _____ (with no duplicate elements) has the property that for every node in the tree, the value of any node in its left subtree is less than the value of the node and the value of any node in its right subtree is greater than the value of the node.

Which of the most suitable term for the above blank position.

- | | | |
|-----------------|------------------------|--------------|
| (a) Binary Tree | (b) Binary Heap | (c) AVL Tree |
| (d) Binary Heap | (e) Binary search tree | |

14) Consider the following Figure 1

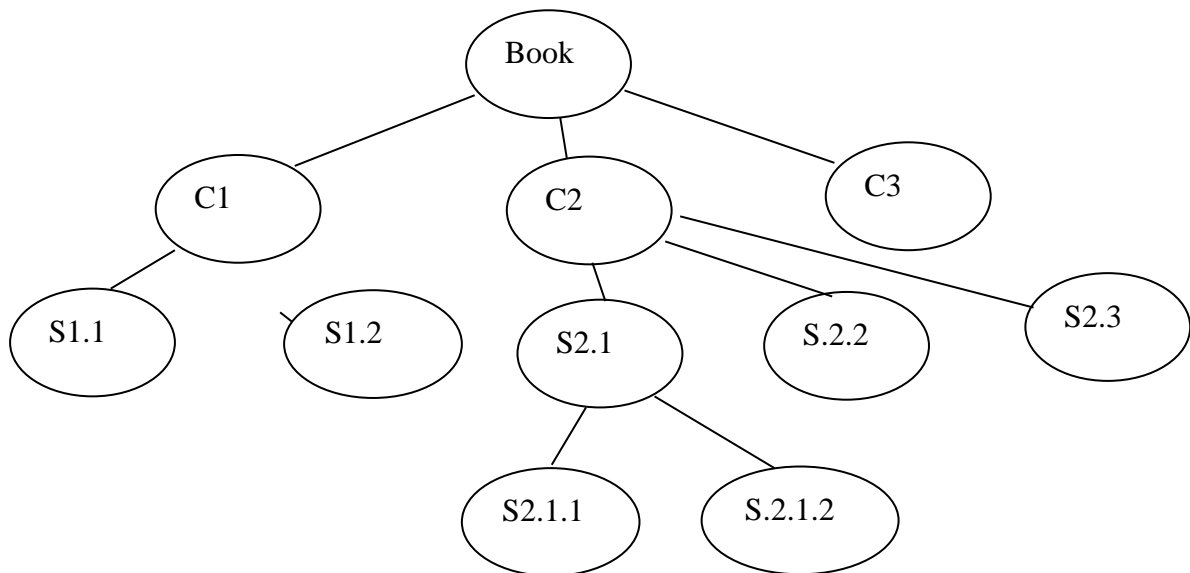


Figure 1

The above Figure 1 shows a table of contents of a book using a tree representation.

Which of the following statement(s) is/are valid in connection with the above tree?

- | |
|---|
| (a) Book is said to be a parent of C1, C2, C3 and C1, C2, C3 are said to be children of book. |
| (b) C1, C2, C3 and book are siblings. |
| (c) Height of the trees is 2. |
| (d) The ancestors of S2.1 are node itself, C2 and book. |
| (e) Length of the path from book to s2.1.1 is 4 |

- 15) How would you construct an AVL tree when a set of numbers is given without performing any single or double rotation?

You may assume that the initial AVL tree is empty.

- (a) Just build the tree with the given input as the way of constructing the BST without considering the Balance Factor.
- (b) Use trial and error methodology.
- (c) Find the median of the set of elements given, take it as root (or parent as appropriately) and construct the AVL tree.
- (d) Use dynamic programming to build the tree.
- (e) There is no way to construct the AVL tree without any rotations.

- 16) Consider the following Pseudo code algorithm

```
static int abc ( BinaryNode t) {  
    if (t == null)  
        return 0;  
    else  
        return 1+math.max(abc(t.left),abc(t.ight));  
}
```

What is the above pseudo code segment intended to do?

- (a) Recursive view used to calculate the length of a tree
- (b) Recursive view used to traverse the tree in pre-order
- (c) Recursive view used to calculate the height of a tree
- (d) Recursive view used to find the minimum node from a tree
- (e) Recursive view used to insert a new node to a tree

- 17) Which of the following are **not** applications of a Breadth First Traversal algorithm?

- (a) When finding the Shortest Path of a unweighted graph
- (b) When Assigning processes to the CPU in a round robin fashion
- (c) Peer to Peer Networks
- (d) When evaluating a mathematical expression
- (e) GPS Navigation systems

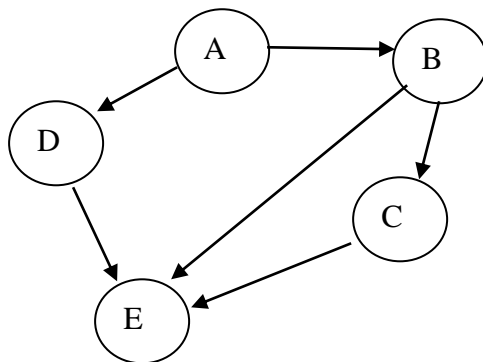
- 18) For a given graph G having v vertices, e edges which are connected and no cycles. Which of the following statement (s) is/are true?

- | | | |
|--------------|---|-----------|
| (a) $v=2e+1$ | (b) $v=e+1$ | (c) $v=e$ |
| (d) $e=v-1$ | (e) Sufficient facts are not available to derive a relationship | |

- 19) The number of elements in the adjacency matrix of a graph having n vertices is

- | | | |
|------------|--|-----------|
| (a) $2n-1$ | (b) $n \log(n)$ | (c) n^2 |
| (d) $n+1$ | (e) It dependent on the number of arcs | |

- 20) Consider the following graph.



What would be the Depth First Traversal (DFT) of the above Graph?

- | | | |
|-----------|-----------|-----------|
| (a) ABEDC | (b) ACBDE | (c) ADEBC |
| (d) AEBCD | (e) ABCED | |

- 21) Assume that you have a directed graph representing all the flights that an airline flies. What algorithm(s) might be used to find the possible sequence of connections from one city to another?

- | | |
|-------------------------------------|----------------------------------|
| (a) Breadth First Traversal /Search | (b) Pre-order traversal /search |
| (c) Linked List traversal | (d) Depth First Traversal/Search |
| (e) A shortest path Algorithm | |

22) What is the time complexity of the following method?

```
public int add(int[] array) {  
    if (array.length < 100) {  
        return 0;  
    }  
    int sum = 0;  
    for (int i = 0; i < 100; i++) {  
        sum += array[i];  
    }  
    return sum;  
}
```

- | | |
|---------------|--------------|
| (a) $O(n)$ | (b) $O(1)$ |
| (c) $O(99)$ | (d) $O(100)$ |
| (e) $O(2n+1)$ | |

23) The following array is given.

[1,2,4,8,5,3,7]

Bubble sort is used to sort the above array. How many iterations will be done to sort the array?

- | | |
|------------|------------|
| (a) 3 only | (b) 7 only |
| (c) 6 only | (d) 5 only |
| (e) 4 only | |

24) Following array of nine elements is given to be sorted using quick sort.

[54,26,93,17,77,31,44,55,20]

The algorithm chooses the first element as its pivot. If only the first partitioning has been completed, which of the following shows the correct order of elements?

- | |
|----------------------------------|
| (a) [26,20,17,44,31,54,77,55,93] |
| (b) [26,20,17,31,54,44,77,55,93] |
| (c) [31,26,20,17,44,54,77,55,93] |
| (d) [20,26,17,44,31,54,77,55,93] |
| (e) [31,26,20,17,55,44,54,77,93] |

25) There is an unsorted array as follows having 6 elements. The array needs to be sorted in ascending order. Heap sort is used to sort the array. Which of the following statement(s) is/are correct?

[4,3,7,1,8,5]

- (a) Max-heap is created and 8 is swapped with 1.
- (b) Min-heap is created and 3 is swapped with 8.
- (c) Max-heap is created and 5 is swapped with 1.
- (d) Min-heap is created and 1 is swapped with 7.
- (e) Max-heap is created and 8 is swapped with 5.
