



**UNIVERSITY OF COLOMBO, SRI LANKA**

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY ( EXTERNAL)**  
*Academic Year 2016 – 2<sup>nd</sup> Year Examination – Semester 4*

***IT4105 – Programming II***  
***Part 1 - Multiple Choice Question Paper***  
***1<sup>st</sup> October, 2016***  
***(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 **08 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 one sorts an array of ten integers using quicksort, and if he/she has just finished the first partitioning as follows.

12, 8, 13, 45, 89, 72, 55, 72, 67, 85

Which statement(s) is/are correct?

- |  |
|--|
| (a) The pivot could be 45, but it is not 55          |
| (b) Only possible pivot value is 13                  |
| (c) The pivot value could be the 13, but it is not 8 |
| (d) Only possible pivot value is 45                  |
| (e) The pivot value could be either 12 or the 45     |

- 2) What are the worst-case, average case and best case running times respectively for Bubble Sort algorithm to sort an array of  $n$  elements?

- |  |                                     |                                       |
|--|-------------------------------------|---------------------------------------|
| (a) $O(n^{3/2})$ , $O(n^2)$ , $O(n^2)$ | (b) $n \log(n)$ , $O(n)$ , $O(n^2)$ | (c) $O(n \log n)$ , $O(n^2)$ , $O(n)$ |
| (d) $O(n^2)$ , $O(n^2)$ , $O(n^2)$     | (e) $O(n)$ , $O(n)$ , $O(n)$        |                                       |

- 3) A Binary Search Tree (BST) is generated by inserting following integers in order:

50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24

The total number of nodes in the left sub-tree and the right sub-tree, respectively are :

- |           |           |           |
|-----------|-----------|-----------|
| (a) (4,7) | (b) (7,4) | (c) (8,3) |
| (d) (3,8) | (e) (5,6) |           |

- 4) Suppose we have numbers between 1 and 1000 in a binary search tree and want to search for the number 363. Which of the following sequence **could not** be the sequence of the node examined?

- |   |
|---|
| (a) 2, 252, 401, 398, 330, 344, 397, 363      |
| (b) 924, 220, 911, 244, 898, 258, 362, 363    |
| (c) 925, 202, 911, 240, 912, 245, 258, 363    |
| (d) 2, 399, 387, 219, 266, 382, 381, 278, 363 |
| (e) 2, 252, 401, 398, 331, 345, 397, 363      |

- 5) Which type of traversal of Binary Search Tree outputs the value in sorted order?

- |                          |                       |                |
|--------------------------|-----------------------|----------------|
| (a) Pre-order            | (b) In-order          | (c) Post-order |
| (d) Breadth First Search | (e) None of the above |                |

- 6) The height of a Binary Search Tree (BST) is given as  $h$ . Consider the height of the tree as the number of edges in the longest path from root to the leaf. What is the maximum possible number of nodes in the tree?

(a) $2^{h-1} - 1$	(b) $2^{h+1} - 1$	(c) $2^h + 1$
(d) $2^{h-1} + 1$	(e) $2\log(h+1)$	

- 7) Which of the following is/are **not** an application of stack?

(a) Finding factorial	(b) Tower of Hanoi
(c) Multiples of Three	(d) Infix to postfix conversion
(e) Finding the most common divisor	

- 8) In an AVL tree, the balance factor of a node A was 0 and a node was inserted to the left of the node A, then

(a) it is required to balance Node A
(b) it is required to balance Parent of node A
(c) it is required to balance Right child of A
(d) Balancing may or may not be required for A
(e) it is required to balance Left child of A

- 9) Consider the following infix expression.

$4+3*(6*3-12)$

If one uses the usual Stack algorithm to convert the expression from infix to postfix notation, what is the **maximum number** of tokens that will appear on the stack **at a time** during the conversion of this expression?

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

- 10) Suppose we have an array implementation of the stack class, with fourteen items in the stack stored at data [0] through data [13]. The maximum capacity of the array is 42. Where does the push method place the new entry in the array?

a) Data[0]	b) Data[42]	c) Data[13]
d) Stack is overflow	e) Data [14]	

- 11) {47, 12, 9, 10, 4, 95, 36, 57} is a set of integers.

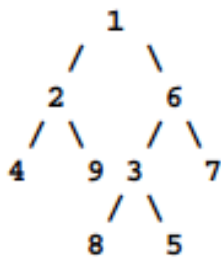
If the binary search tree is created using the above set of integers and if one wants to delete number 12 from the resulting tree, what would one choose as / (a) replacing node(s) for the deletion?

- |        |        |        |
|--------|--------|--------|
| (a) 36 | (b) 4  | (c) 10 |
| (d) 9  | (e) 57 |        |

- 12) The time factor when determining the efficiency of algorithm is measured by

- |  |
|--|
| (a) Counting the execution time using milliseconds         |
| (b) Counting the number of statements in the algorithm     |
| (c) Counting the number of key operations in the algorithm |
| (d) Counting the kilobytes used in the algorithm           |
| (e) Counting the reserved words used in the algorithm      |

- 13) Consider the following diagram.



If one visit the nodes of this tree using a preorder traversal, in what order will the nodes be visited?

- |                          |                       |                       |
|--------------------------|-----------------------|-----------------------|
| (a) 1 2 3 4 5 6 7 8 9    | (b) 1 2 4 9 6 3 8 5 7 | (c) 4 9 2 8 5 3 7 6 1 |
| (d) 4 2 9 1 8 3 5 6 7 10 | (e) 1 2 6 4 9 3 7 8 5 |                       |

- 14) A list of 7 numbers are rearranged in ascending order using a bubble sort algorithm. Maximum number of swaps were used. What can be deduced about the original list of numbers?

- |  |   |
|--|---|
| (a) original data set is unordered                         | (b) original data set is in ascending order |
| (c) original data set is in descending order               | (d) original data set is in random order    |
| (e) original data set is multiples of 5 in ascending order |   |

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

```
stack=[]
for i = 0 to 20
  if i%4 <> 0 then
    stack.append( i )
  endif
next i
```

What would be the final content of stack after the execution completes?

- (a) 4,8,12,16,20
- (b) 0,4,8,12,16,20
- (c) 0,4,8,12,16
- (d) 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20
- (e) 1,2,3,5,6,7,9,10,11,13,14,15,17,18,19

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

```
queue=[] #queue is an array
for i =0 to 20 #20 inclusive
  if i%3 != 0 then
    queue.push( i ) # push element i
  else if i % 4 !=0 then
    queue.pop() # pop the element
  endif
endif
next i
```

- (a) 10,11,13,14,16,17,19,20
- (b) 1,4,7,10,13,16,19,20
- (c) 1,2,4,5,7,8,10,11,13,16,19,20
- (d) 10,11,13,14,16,17,20,19
- (e) 1,4,7,10,12,16,19,20

17) Singly and doubly linked lists are best suited for

- (a) relatively permanent collections of data.
- (b) the size of the structure and the data in the structure are constantly changing
- (c) dynamic expanding situations of data
- (d) store in random numbers
- (e) storing integer values only

(a) 10  
1,4,7,  
1,2,4  
10,11  
1,4,7,10

- 18) If one evaluates the following postfix expression, what would be the existence range of the outcome?

Expression: 9 3 7 6 + - \*

- |                         |                        |                       |
|-------------------------|------------------------|-----------------------|
| (a) Between -15 to -100 | (b) Between -5 and -15 | (c) Between -5 and +5 |
| (d) Between +5 and +15  | (e) Between 15 and 100 |                       |

- 19) Consider the usual algorithm for determining whether a sequence of parentheses is balanced or not.

Suppose that you run the algorithm on a sequence that contains 2 left parentheses and 3 right parentheses (in some order). What is the **minimum number of parentheses** that will appear on the stack **at one time** during the computation?

- |       |                                     |       |
|-------|-------------------------------------|-------|
| (a) 1 | (b) 2                               | (c) 3 |
| (d) 0 | (e) No sufficient data are provided |       |

- 20) Which of the following operations is performed more efficiently by doubly linked list than by singly linked list?

- |   |
|---|
| (a) Deleting a node whose location is given             |
| (b) Searching an item from a given unsorted list        |
| (c) Inverting a node after the node with given location |
| (d) Traversing a list to process each node              |
| (e) Inserting a node whose insertion location is given  |

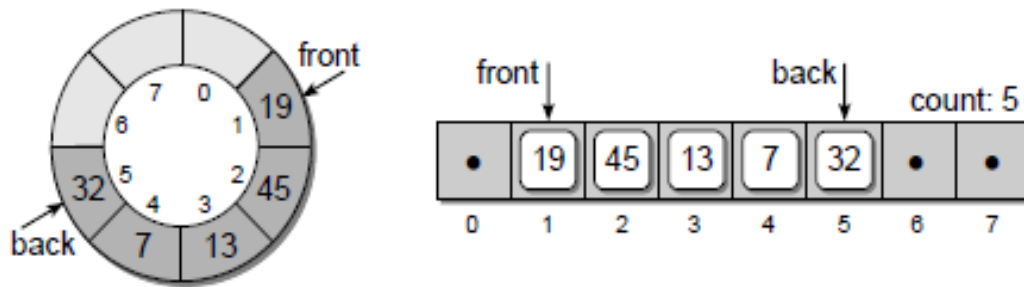
- 21) One wants to add 412 and 3917 using stacks.

If he/she uses three (03) stacks and a variable to perform the above addition, what would be the top element in the resulting stack at each intermediate step during the addition?

Hint : When performing the addition, a variable has to be used to store the tenth's position value and one's position value needs to be pushed to the resulting stack (e.g. the tenth's position value of number 16 is 1 and one's position is 6)

- |              |              |             |
|--------------|--------------|-------------|
| (a) 4,3,2,9  | (b) 7,0,4,7  | (c) 9,2,3,4 |
| (d) 9,2,13,3 | (e) 3,13,2,9 |             |

- 22) Consider the following circular queue.



One wants delete a node from the above circular queue. What are the parameter values (front, back and count) after the deletion?

- |                            |                             |                            |
|----------------------------|-----------------------------|----------------------------|
| (a) front=2,back=5,count=4 | (b) front=0,back=5,count=5  | (c) front=1,back=4,count=4 |
| (d) front=2,back=5,count=5 | (e) front=1,back=5, count=4 |                            |

- 23) Which of the following sorting algorithm(s) is/are of priority queue sorting type?

- |                    |                    |                |
|--------------------|--------------------|----------------|
| (a) Bubble sort    | (b) Insertion sort | (c) Merge sort |
| (d) Selection sort | (e) Heap sort      |                |

- 24) Which of the following sorting algorithm(s) is/are of divide and conquer type?

- |                 |                |                |
|-----------------|----------------|----------------|
| (a) Bubble sort | (b) Merge sort | (c) Radix Sort |
| (d) Heap sort   | (e) Quick sort |                |

- 25) What are the maximum and the minimum heights of an AVL tree when the total number of nodes is equal to 7, 8, 9 and 11 respectively?

(a)

No. of Nodes	Maximum Height	Minimum Height	
7	3	2	
8	3	3	
9	3	3	
11	4	3	

(b)

No. of Nodes	Maximum Height	Minimum Height	
7	2	2	
8	3	3	
9	4	3	
11	4	3	

(c)

No. of Nodes	Maximum Height	Minimum Height	
7	3	2	
8	3	3	
9	3	3	
11	4	3	

(d)

No. of Nodes	Maximum Height	Minimum Height	
7	3	2	
8	4	3	
9	4	3	
11	4	4	

(e)

No. of Nodes	Maximum Height	Minimum Height	
7	3	2	
8	3	3	
9	3	3	
11	4	3	

\*\*\*\*\*