UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2019 – 2nd Year Examination – Semester 4

IT4105 – Programming II
Part 1 - Multiple Choice Question Paper
23rd November   2019
(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 <u>**one or more**</u> correct answers.

- All questions 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 machine will be marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

1) Which of the following statements is/are true related to Stack representation?

(a) Popping is an act of taking values off from the stack.

(b) Stack is used for recursion.

(c) Stack data structure is LIFO.

(d) Stack is used for breadth first traversal of a graph.

(e) Popping is an act of adding elements to the stack.

2) Consider the following pseudocode.

```
function stack(String word){
    while ( more characters to read in the word)
    {
        read a character
        push the character on the stack
    }
    while ( the stack is not empty )
    {
        pop a character off the stack
        print the character on the screen
    }
}
```

What is the output if one calls the above function as stack (Programming2)?

(a) Programming2	(b) 2Programming	(c) 2gnimmargorP
(d) gnimmargorP2	(e) gnimmargorP	

3) Evaluate the following pseudocode segment using a dry run (hand execute).

```
q = queue();
for(j=1; j<5;j++)
{
   q.enqueue (i);
}
for(i=1;i<5;i++)
{
   if(i%4 == 0)
   {
        q.dequeue()
   }
   else{
        q.enqueue(i+2)
   }
}
```

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

(d) 2,3,4,5,3,4,5   (e) 1,2,3,4,5,3,4

4) Consider the following pseudocode,

```
void func(int n)
{
    Stack S;  //stack is initialized to empty
    while (n > 0)
    {
      push(n%2);

      n = n/2;
    }

    while (!isEmpty(S))
      printf("%d ", pop());
}
```

What is the functionality of the above pseudocode function?

(a) Prints n in reverse order.

(b) Prints binary representation of n in reverse order.

(c) Prints binary representation of n.

(d) Prints the value of log n.

(e) Prints the value of log n in reverse order.

5) Consider the following pseudocode segment,
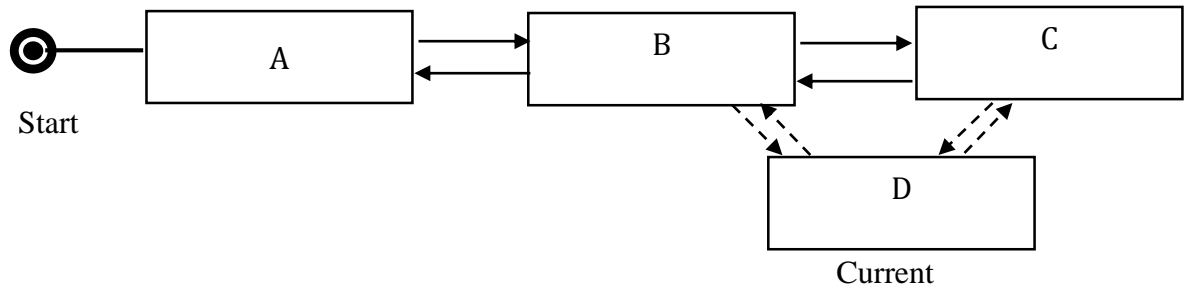
```
int func(int n) {
    if (n==0)
        return n;
    else
        return (n + func(n-1) +1);
}
```

What is the return value of calling **func(8)** for the above function?

(a) 36   (b) 40   (c) 28

(d) 40320   (e) 44

6) Consider the following doubly linked list.

Choose the correct code segment(s) to **add current node (D)** between B and C, as shown below.

Start

Current

Which of the following code segment(s) show(s) the correct insertion?

(a) Current.next = Start.next.next

(b) Start.next.next =Current

(c) Current.prev = Start.next

(d) Current.next.prev =Current

(e) Current.prev = Start.next.next

7) What is the time complexity of printing all the elements of a circular link list that consist of n nodes?

(a) O(1)	(b) O(n)	(c) O(log$_n$)
(d) O(n^2)	(e) O(2n)	

8) Which of the following statements is/are true regarding **Stack** and **Queue** data structures?

(a) Stack and Queue are both linear data structures.
(b) Stack insertions and deletions are performed only at one end.
(c) In a Queue, insertions are performed at the end while deletions are performed at the front.
(d) Stack insertion and deletions are known as Push and Pop respectively.
(e) Queue insertion and deletion terms are known as Dequeue and Enqueue respectively

9) You are given an array implementation of the circular queue (java based) declared as data[….]. Items data [3] and data [4] are filled. The length of the array is 5 and the rest of the locations of the array are empty. Where does the enqueue method place the new two entries in the array?

(a) Array[3] and Array[4].
(b) Array[2] and Array[3].
(c) Array[1] and Array[2].
(d) Array[0] and Array[1].
(e) None of above.

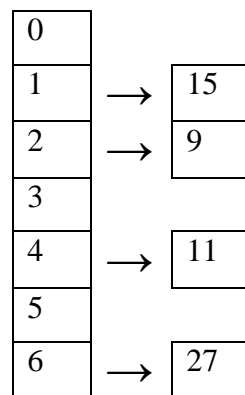**10)** Consider the following chain hash function.
   HashIndex = key % noOfBuckets.

Suppose you are given a hash table with 7 buckets (0,1,2,3,4,5,6), and the following keys have already arrived.
15,11,27,9.
If the next keys to be hashed are 8 and 23, what are the buckets that the new keys will hash to?

0	
1	→ 15
2	→ 9
3	
4	→ 11
5	
6	→ 27

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

11) Assume that there are no collisions and there is enough memory for a Hash table data structure. What is the time complexity for put () (adding/ hashing an element to the hash table) operation for a hash table?

(a) $O(1)$ (a) $O(n)$ (a) $O(\log_n)$
(b) $O(n^2)$ (c) $O(2n)$

12) Consider the following nested representation of binary trees.
(P Q R) indicates Q and R are the left and right sub trees, respectively, of node P.
Note that Q and R may be NULL, or further nested.

Which of the following represents (a) valid binary tree(s)?

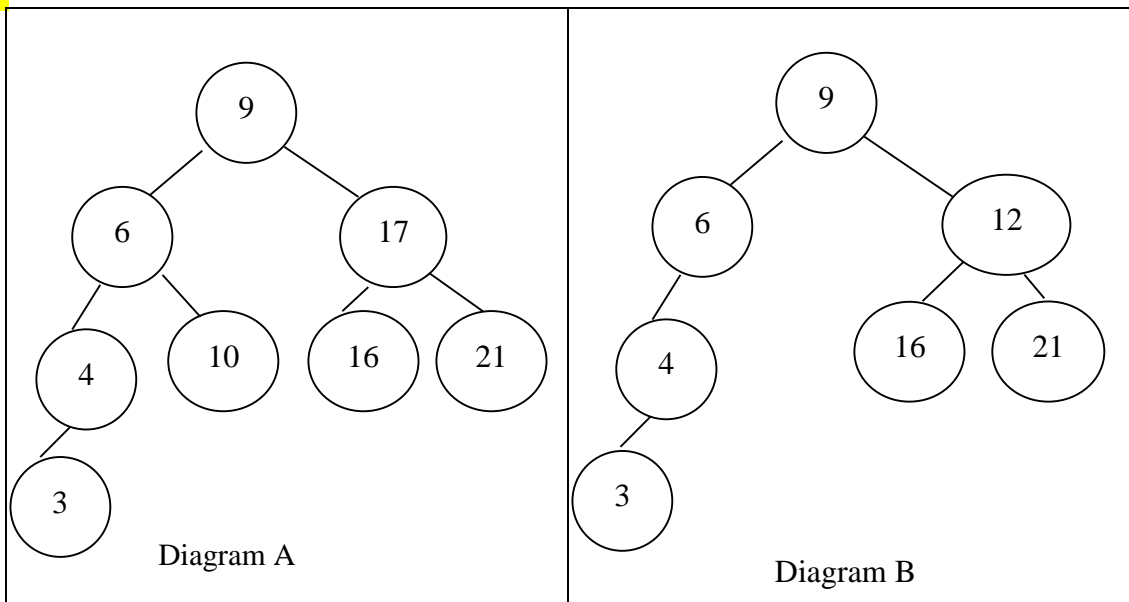|		
(a) (1 2 (4 5 6 7))	(b) (1 (2 3 4) 5 6) 7)	(c) (1 (2 3 4) (5 6 7))
(d) (1((2 3 Null) (4 5))	(e) (1 (2 3 Null) (4 Null Null)	

13) The following numbers are inserted into an empty binary search tree in the given order:

11, 1, 3, 5, 15, 12, 16, 26, 30.

What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?

(a) 3	(b) 4	(c) 2
(d) 4,3	(e) 3,4	

14) Consider the following trees.

Diagram A

Diagram B

Which of the following statements is/are true about to the above two diagrams A and B?

(a) Both Diagram A and Diagram B are Binary Trees.
(b) Both Diagram A and Diagram B are Binary Search Trees.
(c) Both Diagram A and Diagram B are AVL Trees.
(d) Diagram A and Diagram B are Not AVL Trees.
(e) Diagram A is an AVL tree, but Diagram B is not an AVL tree.

15) The array representation of a complete binary tree contains the data in sorted order. Which traversal of the tree will produce the data in sorted form?

(a) In-order traversal.
(b) Post-order Traversal.
(c) Pre-order Traversal.
(d) Depth First Traversal.
(e) Breadth first Traversal.

16) The minimum number of edges in a connected cyclic graph on n vertices are:

(a) n-1	(b) n-2	(c) n
(d) n+1	(e) none of the above	

**17)** Which of the following is/are useful data structures in traversing a given graph by breadth first search?

(a) Singly Linked List
(a) Doubly Linked List
(c) Stack
(d) Queue
(e) None of the above

18) Which of the following statements is/are valid in connection with graph data structures?

(a) GPS Navigation system to find neighboring locations are an example of a graph application.
(b) Graph is a non-linear data structure.
(c) Each node can have any number of edges.
(d) Each node can have at the most two child nodes.
(e) A cycle cannot be formed.

19 Consider the following directed graph.
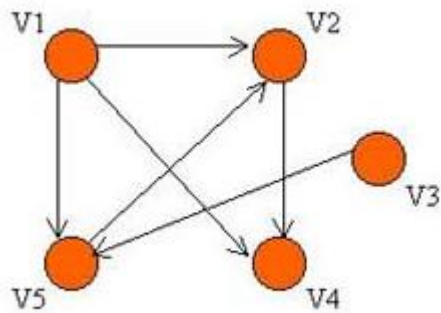
Which of the following statements is/are valid in connection with the above directed graph?

(a) Correct Matrix representation of path of length 2 is equal to:

	V1	V2	V3	V4	V5
V1	F	T	F	T	F
V2	F	F	F	F	F
V3	F	T	F	F	F
V4	F	F	F	F	F
V5	F	F	F	T	F

(b) There is a direct path from Node V1 to V3, when the path of length is equal to 1.

(c) One can traverse from node V1 to node V2, or from node V1 to node V4 in two moves.

(d) In general, to generate the adjacency matrix of path of length n, take the matrix of path of length n-1, and multiply it with the matrix of path of length 1.

(e) The existence of an edge between two vertices V_I and V_J is represented by an entry of 1 in the Ith row and J^{th} column of the adjacency matrix.

20) What does the following function do for a given binary tree?

```
static int abc(Node root)
{
    // Base cases.
    if (root == null || (root.left == null &&
                         root.right == null))
        return 0;

    // If root is Not NULL and its one of its
    // child is also not NULL
    return 1 + abc(root.left) +
               abc(root.right);
}
```

(a) Count the total number of leaf nodes in a tree.

(b) Returns the height where height is defined as the number of edges on the path from root to deepest node.

(c) Return the diameter where the diameter is the number of edges on the longest path between any two nodes.

(d) Count the number of non-leaf nodes in a tree.

(e) Count the total number of nodes in a tree.

21) The following is related to the binary search algorithm for finding a key-value.

Given an array Array1 = {46,77,88,91,94,99,105} and key = 99; what are the mid values (corresponding array elements) in the first and second levels of recursion when finding the key?

(a) 81,88	(b) 91,99,77	(c) 91,77
(d) 94,99	(e) 91,99	

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

```
public int add(int n) {
   int a=0, i=n;
   while ( i > 0 ) {
       a += i;
       i /= 2;
   }
   return a;
`      }
```

(a) O(n)	(b) O(1)	(c) O(log n)
(d) O(n log n)	(e) O(n/2)	

23 Which of the following statement(s) is/are correct regarding sorting algorithms?

(a) Heap Sort has the worst-case time complexity of O(n log(n)).

(b) Merge Sort has the best-case time complexity of O(n).

(c) Heap Sort is an in-place sorting algorithm.

(d) Insertion Sort makes no more than O(n log(n))) pair-wise comparisons.

(e) Selection Sort has the worst-case time complexity of $O(n^2)$.

24 The following array needs to be sorted in ascending order using heap sort. Which of the following statement(s) is/are correct?

$$[6,3,12,1,5,8]$$

(a) Max-heap is created and 12 is swapped with 8.	(f) Heap Sor
(b) Max-heap is created and 8 is swapped with 3.	(g) Merge Sc
(c) Max-heap is created and 12 is swapped with 1.	(h) Heap Sor
(d) Min-heap is created and 5 is swapped with 3.	(i) Insertion
(e) Max-heap is created and 6 is swapped with 1.	(j) Selection

25 You are given the following array. How many comparisons are required to search using binary search algorithm when the target value is equal to 16?

$$[8, 15, 17, 16, 19, 23, 31, 48, 56, 59, 78, 82]$$

Note: Set top=arraysize – 1; set bottom = 0; and when calculating the middle, set middle to the ceiling of (top+bottom)/2.

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

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