UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2014/2015 – 2nd Year Examination – Semester 4

IT4105: Programming II
Part 1 - Multiple Choice Question Paper

01th August, 2015
(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 **11 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 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) When determining the **efficiency of an algorithm**, the space factor is measured by

> (a) counting the maximum memory needed by the algorithm.
> (b) counting the minimum memory needed by the algorithm.
> (c) counting the average memory needed by the algorithm.
> (d) counting the maximum disk space needed by the algorithm.
> (e) counting best case disk space needed by the algorithm.

2) Which algorithm(s) show(s) the same running time as $O(n^2)$ in best, average and worst case situations?

> (a) Heap Sort Algorithm
> (b) Bubble Sort Algorithm
> (c) Radix Exchange Sort
> (d) Quick Sort
> (e) Shell sort

3) The array S has the following integer values.

S[1…7]=[6,7,5,12,8,9,1]

What is the outcome of the following piece of pseudo code implemented on S after one pass of the outer loop?

```
for i= 1 to n-1 {
   min=S[i];
   p=i;
     for j=i+1 to n {
        if (S[j] <min ) then {
          min=S[j];
          p=j;
        }
     S[p]=S[i];
     S[i]= min
   }
}
```

(a) 1,5,7,12,8,9,6	(b) 1,5,6,7,8,9,12	(c) 1,7,5,12,8,9,6
(d) 12,9,8,7,6,5,1	(e) 1,9,8,12,5,7,6	

4) The array P has the following integer values.

P[1..n]=[[6,7,5,12,8,9,1]

What is the outcome of the following piece of pseudo code implemented on P?

```
for i=1 to 3 {
  if ( P[i] < P[n-i+1]) then {
     temp=P[i];
     P[i]=P[n-i+1];
     P[n-i+1]=temp;
  }
}
```

(a) 1,5,6,7,8,9,12	(b) 12,9,8,7,6,5,1	(c) 6,9,8,12,5,7,1
(d) 1,7,5,12,8,9,6	(e) 1,9,8,12,5,7,1	

5) Consider the following incomplete sentence.

In a stack, trying to remove an element from the empty stack is called ……(i)………… and trying to push an element from full of stack is called ……..(ii) ……..

Which is the most suitable term for the above (i) and (ii)?

(a) (i) empty collection (ii) crash	(b) (i) underflow (ii) crash
(c) (i) overflow (ii) underflow	(d) (i) user flow (ii) overflow
(e) (i) underflow (ii) overflow	

6) Executes the following pseudo code segment.

```
values = Stack ()
for (int i=0;i<16;i++)
{
  if (i % 3 == 0  or i % 5==0  )
     values.push( i )
  elseif  (i % 4 == 0 )
     values.Pop()
}
```

What are the contents of the resulting stack?

(a) 0,5,9,10,12,15	(b) 6,9,10,15
(c) 0,5,9	(d) 0,5,9,15
(e) 0,1,2,3,5,14,15	

7) Which of the following is a /are valid statement(s) in connection with stacks?

> (a) A stack is a linear structure that can be accessed only at one of its ends for storing and retrieving data.
> (b) In java, stacks cannot be implemented using an array.
> (c) A stack looks like a stack of trays in a cafeteria where new trays are put on the top of the stack and taken off the stack.
> (d) First in – First out methodology is used in stack application.
> (e) Compilers use stacks to evaluate mathematical expressions.

8) If the following sequence of operations is performed on a stack, what would the outcome sequence be?
> (i) Push(1)
> (ii) Pop( )
> (iii) Is_empty( )
> (iv) Pop( )
> (v) Push(-1)
> (vi) Push(5)
> (vii) Pop()
> (viii) Is_empty()
> (ix) Pop()
> (x) Is_empty()

> (a) 1,false,overflow,5,false,underflow,-1
> (b) 1,true,overflow ,5,false,-1,true
> (c) 1,false,underflow,5,true,-1,true
> (d) 1,true,underflow,5,false,-1,true
> (e) 1,true,underflow,-1,false,5,true

9) Consider the Java code segment given below.

```java
int pqr(int n)
{
  if (n == 1)              // base case
    return 1;
  else
    return n + pqr(n-1);        // recursive call }
```

The above java code instructs to

> (a) get the greatest common divisor.
> (b) generate Fibonacci numbers using recursive manner.
> (c) get the summation of first n numbers.
> (d) calculate multiples of one.
> (e) get the factorial of n.

10) Consider the following queue with initial states and a series of queue operations as given below.

				2	3		

Front   rear
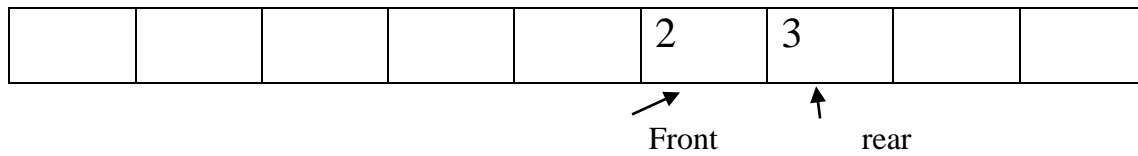
Order of queue operations

Enqueue(6);
Dequeue( );
Enqueue(7);
Is_empty( );
Is_full( );
Dequeue ( );
Dequeue( );
Enquque(9);
Is_empty()

If the above series of operations is performed in that order, what would be the outcomes?

(including the intermediates outcomes)

(a) 2,false,true,3,false
(b) 2,false,false,3,6,true
(c) 2,false,false,3,6,false
(d) 6,false,true,2,3,false
(e) 6,false,true,2,3,true

11) A doubly linked list consisted of dummy header (as Header) and dummy tail (as Tail) in addition to the cell nodes. If the doubly linked list is empty, what is the relationship between the Header and Tail?

Note: there are two references **next and previous**.

(a) Header.next.next=null   (b) Tail.previous.prvious=null
(c) Tail.previous.prvious=Header   (d) Header.next=Tail
(e) Tail. previous=Header

12) If one creates the AVL tree using the following data set, how many

  (i) Singe rotation(s) ,

  (ii) Double rotation(s) are involved?

Data set : 10, 20, 30, 25, 27, 7, 4, 23, 26, 21

(a) (i) 2 (ii) 2   (b) (i) 1 (ii) 3   (c) (i) 3 (ii) 1
(d) (i) 2 (ii) 3   (e) (i) 3 (ii) 2

13) Consider the following Java code segment.

```
//*  this is a recursive program
Static int question12 (BinaryNode t)
{
if  (t = = null)
return 0
else
return 1+question12(t.left)+ question12 (t.right)
}
```

What is the above Java code segment intended to do?

(a) Determine the height of an AVL tree.
(b) Compute the height of a binary search tree.
(c) Find the minimum value from a binary search tree.
(d) Find the maximum value from a binary search tree.
(e) Compute the size of a binary tree.

14) {55, 12, 9, 10, 4, 85, 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 you choose as (a) replacing node (s) for the deletion?

(a) 36   (b) 55
(c) 9   (d) 10
(e) 85

15) Linked lists are best suited

(a) for relatively permanent collections of data.
(b) when the size of the Linked list is constantly changing.
(c) when the number of the elements to be stored is unknown in advance.
(d) when a non-linear representation is wanted.
(e) when no contiguous memory locations are available.

16) Suppose one sorts an array of eight integers using quicksort, and he/she has just finished the first partitioning with the array looking like this.

   2 5 1 7 9 12 11 10

Which statement(s) is/are correct?

(a) The pivot could be the 7, but it is not the 9.
(b) The pivot is not the 7, but it could be the 9.
(c) Neither the 7 nor the 9 is the pivot.
(d) The pivot could be either the 7 or the 9.
(e) No sufficient data is provided.

17) Consider the following binary tree.
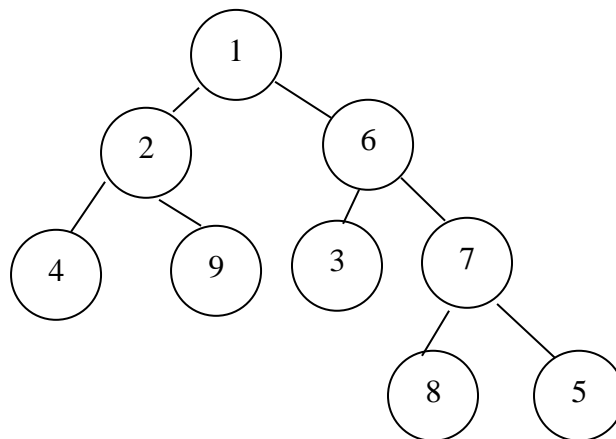
If one visits the nodes of this tree using (i) pre-order (ii) in-order and (iii) post-order traversals, in what order will the nodes be visited?

(a) (i) 1, 2, 3, 4, 5, 6, 7, 8,9   (ii) 4, 9, 2, 3, 8, 5, 7, 6, 1   (iii) 1, 2, 4, 9, 6, 3, 7, 8, 5
(b) (i) 1, 2, 4, 9, 6, 3, 7, 8, 5   (ii) 4, 2, 9, 1, 3, 6, 8, 7, 5   (iii) 4, 9, 2, 3, 8, 5, 7, 6, 1
(c) (i) 4, 9, 2, 8, 5, 3, 7, 6, 1   (ii) 4, 9, 2, 3, 8, 5, 7, 6, 1   (iii) 4, 2, 9, 1, 3, 6, 8, 7, 9
(d) (i) 4, 2, 9, 1, 8, 3, 5, 6, 7   (ii) 1, 2, 4, 9, 6, 3, 7, 8, 5   (iii) 4, 9, 2, 3, 8, 5, 7, 1, 6
(e) (i) 1, 2, 4, 9, 6, 3, 8, 5, 7   (ii) 4, 9, 2, 3, 8, 5, 7, 6, 1   (iii) 4, 9, 3, 2, 8, 5, 7, 6, 1

**18)** Consider the following algorithm segment with blanks.

```
public void swap() {
int p,q,r
(i)……………….
(ii)………………
(iii)………………
}
```

Identify suitable statements to fill the blank positions in the above algorithm so that it will exchange the values of the two variables p and q.

(a) (i) r=p; (ii) p=q; (iii) q=r ;   (b) (i) q=p,(ii) p=r; (iii) r=p;
(c) (i) p=q; (ii) q=p; (iii) q=r ;   (d) (i) r=q; (ii)q=p;(iii)p=r;
(e) (i) q=p;(ii) p=q; (iii) r=p;

19) Consider the following doubly linked list.

current
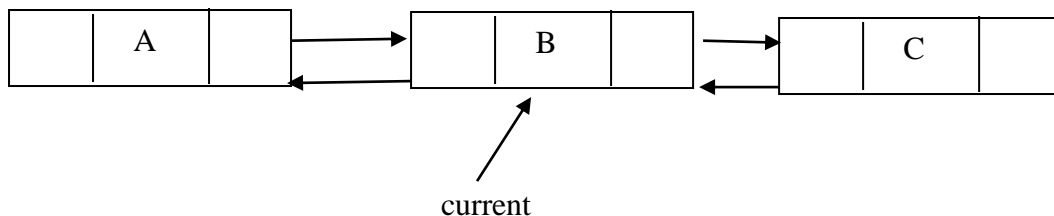
Note: there are two references backward and forward.

If one wants to insert a new node (reference as **New** and element as **D**) in between the node B and C, what would be the appropriate Java code segment for linking?

(a) current.forword.backword= new;
    new.backword=current;
    new.forword=current.forword;
    current.forword=new ;

(b) current.next=new,
    current.forword.backword= new;
    new.backword=current;
    new.forword=current.forword;

(c) new.bacword=current;
    new.forword=current.next;
    new.forword.backword=new;
    new.backword.forward=new;

(d) current.nest=new;
    new.backword=current;
    new.forword=current.forword;
    current.forword.backword= new;

(e) current.next=new,
    new.backword=current;
    current.forword.backword= new;
    new.forword=current.forword;

8

Consider the following incomplete paragraph in connection with AVL trees.

An AVL tree is a ………(i)……tree with the additional balance property that for any node in the tree, the height of the left and right sub-trees can defer by, at most 1. If these three nodes lie in a straight line, ……….(ii)……… is needed to restore the balance. If these three nodes lie in a "dog-leg" pattern, you need to perform the ……… (iii)………. to restore the balance. Double rotation consists of two single rotations. These two rotations are in …….. (iv)…………directions.

The correct terms for the blank positions are

(a) (i) binary search	(ii) single rotation	(iii) double rotation	(iv) single direction
(b) (i) binary search	(ii) single rotation	(iii) double rotation	(iv) clockwise
(c) (i) binary search	(ii) single rotation	(iii) double rotation	(iv) opposite
(d) (i) binary search	(ii) double rotation	(iii) single rotation	(iv) opposite
(e) (i) binary search	(ii) double rotation	(iii) single rotation	(iv) clockwise

Consider the merge sort algorithm and data set given below.

MergeSort(arr[], l, r)

If $r > l$

1. Find the middle point that divides the array into two halves:

m = (l+r)/2

2. Call mergeSort for first half:

Call mergeSort(arr, l, m)

3. Call mergeSort for second half:

Call mergeSort(arr, m+1, r)

4. Merge the two halves sorted in step 2 and 3:

Call merge(arr, l, m, r)

where m is the middle point of the array, r is the number of elements in the array and arr is name of the array. Merge sort use the divide-and-conquer approach.

Data Set : **79, 50, 67, 26, 59, 78, 69**

One wants to sort the data set given above based upon the merge sort algorithm. How many sub files are needed to sort the file using the divide and concur approach?

Note: You need not count the initial stage (original file) and the final stage (sorted file).

(a) 21	(b) 19
(c) 20	(d) 17
(e) 18	

22) If one chooses (i) minimum value (ii) first element as the pivot values, how many pivot values are needed to sort the following data set?

Data set: 4, 1, 10, 7, 21, 51, 3

(a) (i) 5 (ii)4	(b) (i) 6 (ii) 4
(c) (i) 6 (ii) 55	(d) (i) 7 (ii) 5
(e) (i) 6 (ii) 6	

23) Consider the following pseudo code segment.

```
a=0;
b=1;
while b < 1000
{
  print(b,"  ")
  a=b;
  b=a+b;
}
```

If one executes the above pseudo code segment, what would be the first three values and the last three values that the pseudo code generates?

(a) 1, 2, 4………..256, 512, 1024
(b) 1, 2, 4………..128, 256, 512
(c) 0, 1, 2……… 376, 609, 986
(d) 1, 1, 2, ………377, 610, 987
(e) 1, 2, 3, ………377, 610, 988

24) Consider the following pseudo code segments.

```
abc( n)
if n=1
   return 3
else
return abc(n-1) +1;

for i = 1 to 10
print (abc(i));
```

If one executes the above pseudo code segments, what would be the number series that generates the pseudo codes?

(a) 0,3,6,9,12,15,18,21,24,27
(b) 0,3,6,9,12,15,18,21,24,27,30
(c) 3,9,27
(d) 3,6,9,12,15,18,21,24,27
(e) 3,6,9,12,15,18,21,24,27,30

25) Consider the Bubble Sort pseudo code algorithm and the data set stored in Array M given below.

Max ← 8

For count1 ← 1 to (max-1) do

    For count2 ← count1+ 1 to max do

      If M(count2-1)> M(count2) then

        Temp=M(count1)

        M(count1)=M(count2)

        M(count2)=temp

      Endif

    Endfor

Endfor

Data set is: M(1…..8)= 12, 9,16, 4, 78, 85, 21,2

If one uses the above algorithm to sort the data set, how many (i) comparisons (ii) exchanges respectively are needed in first iteration of the inner loop?

(a) (i) 7 (ii) 4	(b) (i) 7 (ii) 7
(c) (i) 7 (ii) 49	(d) (i) 49 (ii) 32
(e) (i) 7 (ii) 3	

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