GCIS-124 Software Development and Problem Solving II **Fall 2021/2022**
Suggested Problems for the Midterm
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Q1) Complete the below function which returns the number of hashtags that exists in a given input string. For example, if the input is "p@ra##1#", then the output is 3.

```
int numOfHashtags(String s){



}
```

Q2) Complete the below function which returns the second maximum integer in a given array A. For example, if A={13, 18, 9, 22, 15, 8, 22}, then the function should return 18.

```
int secondMax(int[] A){



}
```

Q3) Which of the following statements is true about bytecode?

A. It is generated by JVM
B. It is executed by JVM
C. It is stored in a file with the extension .class
D. It is stored in a file with the extension .out
E. A + C
F. B + C
G. A + D
H. B + D

Q4) Which of the following is a valid overloading of the method: int compute(int a, char b)

A. double compute(int a, char b)
B. int compute(int k, char b)
C. int compute(double a, char b)
D. A + C
E. A + B + C

Q5) How many syntax errors exist in the below A.java file?

A. No errors
B. 1
C. 2
D. 3
E. 4
F. 5
G. 6

```
public class A{
   private final B inst;

    public A(){
       inst = new B();
    }

    public A(int x){
       inst = new B(x);
    }

    public B getB(){ return inst; }
}

public class B {
    private int x ;

    public B(int x){
        this.x = x ;
    }

    public getX(){ return x; }
}
```

Q6) Which of the following statements is true about the below class A?

```
public class A {
    private static int x = 5;

   // code for constructors and methods is omitted
}
```

A. Only one copy of variable ***x*** exists in memory
B. The value of ***x*** cannot be changed.
C. The class has a syntax error because a class must be static in order to have static variables
D. All statements are false

Q7) Complete the implementation of the *equals* method for the below Teacher class using the same convention we studied in class. Note that two Teacher instances are equal if they have the same name and the same ID.

```
public class Teacher {
     private String name;
     private long ID;

    // code for constructors and other methods is omitted

    @Override
     public boolean equals(Object obj){   // this function is to be completed by the student









    }
}
```

Q8) Read the brief descriptions below and use the table to indicate whether you think the final implementation will be an *enum*, *class*, *interface* or *abstract class*. If you think the type is a subclass of some other type, indicate its super class as well (or type NA if it has no parent).

- A toy has a unique 7-digit product code, a name, and an MSRP. All toys can be played with, but each toy does something different.
- A robot is a toy that can be charged. When a robot is played with, it makes a sound ("Bleep Bloop!") and its charge is depleted by 20%.
- A doll is a toy with hair color, eye color, and a voice box that says different phrases when played with.
- An action figure is a toy with hair color, eye color, a voice box, and may or may not have Kung-Fu GripTM.

Name	Type	Super Class?
Toy		
Robot		
Doll		
Action Figure		

Q9) Let us say we have interface A and interface B, and we want interface A to inherit all the methods of interface B. Which of the following is a proper declaration of interface A?

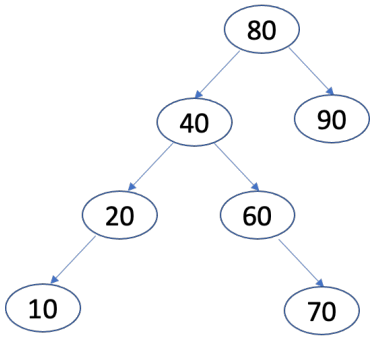
A. public interface A extends B
B. public interface A implements B
C. public interface A extends interface B
D. public interface A implements interface B

Q10) In Java, which of the following methods is inherited from the Object class?

A. toString method
B. equals method
C. hashcode method
D. B + C
E. A + B + C

Q11) Assume that you are given the below BST. Draw the BST after performing the below insert operations into the BST.

insert (30)
insert (85)
insert (55)



Q12) Assume that you are given the below min-heap, which has 10 items. Draw the min-heap after performing the following add and remove operations.

2	4	5	7	11	6	9	8	10	12		

remove ( )
remove ( )
add (3)

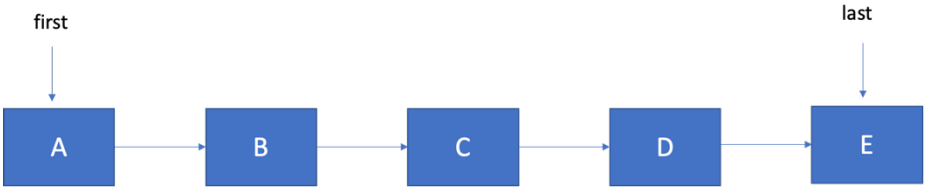
Q14) In the below function, write code that returns true if the given array *A* has distinct integers (i.e., has no duplicates). For example, the function should return true if A = {5, 7, 8, 9}, while it should return false if A = {2, 7, 2, 0, 8}. You may use any of the data structures we studied in class.

```
boolean isDistinct (int[] A){




}
```

Q15) Assume you are given the below LinkedList<E>.



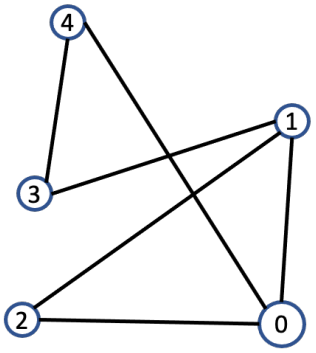
Now consider the below function:

```
public E mystry(int x){
   Node<E> ptr = first;
   for(int i=0; i<x; i++)
       ptr = ptr.getNext();
   return ptr.getItem();
}
```

What is the returned item when mystry(3) is invoked for the above LinkedList? _____

Q16) Fill-in the adjacency list for the following graph.

Vertex	Neighbors
0	
1	
2	
3	
4	



Q17) Consider again the graph shown in the previous question. Which of the following paths is possible when performing DFS using 0 as the start vertex and 4 as the end vertex?

A. 0 – 1 – 3 – 4
B. 0 – 4
C. 0 – 2 – 1 – 3 – 4
D. A + B
E. A + B + C