الجامعة السعودية الالكترونية
Saudi Electronic University
2011 1432

Ministry of Higher Education
Saudi Electronic University
College of Computing and Informatics

Midterm Makeup Examination Cover Sheet

Spring- Semester: 1434-35 / 2014-2015

Course Instructor:		**Exam Date:**	
Course Title:	**Computer Programming 2**	**Course Code:**	**CS141**
Exam Duration:	**60 Minutes**	**Number of Pages:** (including cover page)	**6**

Exam Guidelines

- **Mobile phones are not permitted.**
- **Calculators are permitted.**

Marking Scheme

Questions	Score
Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
Exam Score / 50	
Final Score / 25	

Student Name:		**Student ID:**	

Q1. For each of the following multiple-choice questions, choose <u>one</u> correct answer.

1. _____ occurs when a single class has several methods with the same name but different parameter types.
   a) Overriding
   b) Polymorphism
   c) Overloading
   d) Encapsulation

2. The reserved word to indicate that a class implements an interface type is:
   a) extends
   b) implements
   c) import
   d) inherit

3. Which of the following is a method having same name as that of its class?
   a) Set method
   b) Get method
   c) Constructor
   d) Void method

4. Which of the following statements about abstract methods is true?
   a) An abstract method has a name, parameters, and a return type, but no code in the body of the method.
   b) An abstract method has parameters, a return type, and code in its body, but has no defined name.
   c) An abstract method has a name, a return type, and code in its body, but has no parameters.
   d) An abstract method has only a name and a return type, but no parameters or code in its body.

5. _____ methods must be implemented when using an interface.
   a) Abstract
   b) Private
   c) Public
   d) Static

6. What interface must a class implement in order to be a listener for button ActionEvents?
   a) Action Listener
   b) Event Handler
   c) Text Listener
   d) Button Listener.

7. Which of the following statements are incorrect?
   a) Public members of class can be accessed by any code in the program.
   b) Private members of class can only be accessed by other members of the class.
   c) Private members of class can be inherited by a sub class, and become protected members in sub class.
   d) Protected members of a class can be inherited by a sub class, and become private members of the sub class.

8. Merge sort is _____ algorithm.
   a) $O(n^2)$
   b) O(1)
   c) O(n log n)
   d) O(log n)

9. Which of the following statements about the software development process is true?
   a) In the analysis phase, you develop a plan for how you will implement the system.
   b) In the design phase, you write and compile program code.
   c) In the analysis phase, you discover the structures that underlie the problem to be solved.
   d) In the design phase, you develop a plan for how you will implement the system.

10. What type of algorithm is required to place elements in order?
    a) Searching.
    b) Sorting.
    c) Insertion.
    d) Deletion.

[*10 Marks*]

Q2. For each of the following statements, answer with (True) or (False):

1.	A CRC card describes a class, its relationships, and its collaborating classes.	F
2.	Recursion occurs when a method calls another method.	F
3.	You can convert from a class type to an interface type provided the class implements the interface.	T
4.	Binary Search is also known as Sequential Search.	F
5.	In the design phase of the software development process, you write and compile program code.	F
6.	UML class diagrams are used to describe class responsibilities.	F
7.	Refactoring means restructure the system continuously to improve code and eliminate duplication in extreme programming.	T
8.	Programs that use recursion consume less time and memory.	F
9.	Extreme Programming is a software development methodology which is intended to improve software quality and responsiveness to changing customer requirements.	T
10.	The number of visits in linear search can be written as O(n)	T

[*10 Marks*]

Q3. Suppose an algorithm takes 12 seconds to handle a data set (n) of size 300. Fill in the following table, which shows the approximate growth (in seconds) of the execution times depending on the complexity of the algorithm.

Note, that you MUST also:

- **Show your calculations.** Reduce 1 mark if candidate did not show the calculations.
- **State which algorithm gives the best result and why?** O(n), faster. 1 mark
- **State which algorithm gives the worst result and why?** $O(2^2)$, can't compute. 1 mark
- **Which algorithm is a linear function?** O(n) 1 mark

	O(n)	$O(2^n)$	O(n log n)
1800	72	X	94.6 Approx
36000	1440	X	2648.7 Approx

5 marks for filling the tables with the correct answers. Redduce 1 mark for each mistake to the minimum of zero.

[*8 Marks*]

Q4. Give brief answers to the following questions:

a) Consider the recursive method myPrint. In the method myprint2 we simply changed the location of the recursive call. What does the call to myPrint2(345) print?

```
public void myPrint(int n)
{
  if (n < 10)
    System.out.print(n);
  else
  {
    int m = n % 10;
    System.out.print(m);
    myPrint(n/10);
  }
}

public void myPrint2(int n)
{
  if (n < 10)
    System.out.print(n);
  else
  {
    myPrint2(n/10);
    int m = n % 10;
    System.out.print(m);
  }
}
```

Answer : 345

[*2 Marks*]

b) Does Extreme Programming follow a waterfall or a spiral model?

Answer: An “extreme” spiral model, with lots of iterations

[*2 Marks*]

c) Why would you use an inner class instead of a regular class?

Answer: Inner classes are convenient for insignificant classes. Also, their methods can access variables and fields from the surrounding scope.

[*2 Marks*]

d) Can you search the following array using binary search? Give reasons for your answer.

```
int [] A = {6, 5, 4, 2, 0, 1, -1, -17};
```

Answer: No. For binary search the array has to be sorted.

[*2 Marks*]

e) Should the call x.equals(x) always return true?

Answer: It certainly should — unless, of course, x is null.

[*2 Marks*]

Q5. Solve the following programming questions:

1. The following program calculates the area of a Triangle of width n recursively by calling the getArea() method as explained in your textbook.

Please note the following:

- As explained in your textbook, the triangle is drawn in squares [ ].
  1. [ ]
  2. [ ] [ ]
  3. [ ] [ ] [ ]
- Assume each [ ] square has an area of 1.
- To compute the area of the large triangle shown above (lines 1,2, 3):
  - Area of Triangle= Area of small triangle (lines 1,2) + the width (line 3) of the Triangle.
  - Area of small Triangle (lines 1,2) = Area of small Triangle (line 1) + width (line 2) of small Triangle (lines, 1,2)
  - ….
  - The terminating conditions for this recursive call is having a rectangle of width 1 or less.

Complete the **getArea()** method in this code

```
public class Triangle
{
        private int width;
        public Triangle(int aWidth)
        {
                width = aWidth;
        }

        public int getArea()

        {

                if (width <= 0) { return 0; }              1 Mark
                if (width == 1) { return 1; }              1 Mark
                Triangle smallerTriangle = new Triangle(width - 1);
                                                           2 Marks
                int smallerArea = smallerTriangle.getArea();
                                                           2 Marks
                return smallerArea + width;                2 Marks

        }
}
```

2. Complete the missing lines in the linear search method. The search method takes the value (v) you are searching for in array (a). If the value is found, the position of the array element at which the value is found is returned. If the value is not found, -1 is returned.

```
  public int search(int v)
  {
 for (int i = 0; i < a.length; i++)        1 Mark
 {
        if (a[i] == v)                     1 Mark

         return i ;                        1 Mark
 }
return -1;                                 1 Mark
}

}
```

[*12 Marks*]

END OF THE EXAM … BEST WISHES