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|  | **University of Maryland College Park** |
| **Dept of Computer Science** |
| ***CMSC132 Summer 2012*** |
| ***Midterm I Key*** |

*First Name (PRINT):* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Last Name (PRINT):* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*University ID:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Section/TAName:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*I pledge on my honor that I have not given or received any unauthorized assistance on this examination.*

*Your signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

***Instructions***

* *This exam is a closed-book and closed-notes exam.*
* *Total point value is 100 points.*
* *The exam is a 50 minutes exam.*
* *Please use a pencil to complete the exam.*
* ***WRITE NEATLY****. If we cannot understand your answer, we will not grade it (i.e., 0 credit).*

***Grader Use Only***

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| #1 | Java Language Features | (25) |  |
| #2 | Class Implementation | (75) |  |
| **Total** | Total | (100) |  |

**Problem 1 (25 pts) Java Language Features**

1. (2 pts) What is the difference between an interface and an abstract class?

**Answer:** Definition of methods and instance variables are not allowed in an interface

1. (2 pts) What is the difference between a check and an unchecked exception.

**Answer:** You need to deal with check exceptions (either declare or throw them).

1. (2 pts) When is the finalize() method invoked?

**Answer:** When the object is garbage collected.

1. (3 pts) What is procedural abstraction?

**Answer:** Describes operation without indicating how to implement it.

1. (2 pts) Describe two of the components associated with the Model-View-Controller (MVC).

**Answer:** Any two of: Model🡪 application data, View🡪visual interface, Controller🡪user interaction

1. (2 pts) For our first project (ClearCellGame) which component (of the Model-View-Controller) did you implement?

**Answer:** Model

1. (3 pts) What is the difference between a static initialization block and a non-static initialization block?

**Answer:** Static block is executed when class is loaded.

1. (2 pts) **T** 🡪 A final method cannot be overridden by a subclass.
2. (2 pts) **F** 🡪 The following variable declaration is legal only if the **abstract** class **CPU** has a constructor.

CPU x = new CPU();

1. (2 pts) **T** 🡪 A class extending an abstract class will become abstract if abstract method(s) from the super class are not defined in the subclass.
2. (3 pts) The **Ship** interface defines a single method with the following signature: ***public void stop();*** Using an anonymous inner class complete the following assignment where **x** is assigned an object that

 implements the **Ship** interface and the method stop() will print (using System.out.println) the message

 “Stop Ship”.

**Answer:** Ship x = new Ship() { public void stop() { System.out.println(“Stop Ship”); } };

**Problem 2 (75 pts) Class Implementation**

For this problem you will complete a class named Flight.

public class Flight implements **Comparable<Flight>, Iterable<String>** {

 private int flightNumber;

 private String captain;

 private String[] seats;

 private int numberOfPassengers;

 // Methods you will implement go here

}

For this problem:

1. All the methods are public and non-static.
2. **Constructor** 🡪 It has three parameters (flight number, captain’s name, and maximum number of seats) that are used to initialize the object. The maximum number of seats represents the size of the seats array that will be created by the constructor.
3. **Default Constructor** 🡪 It initializes the object using the values 2, “STAFF”, and 10. You must use “this” to call the previous constructor, otherwise you will not receive any credit.
4. **addPassenger** 🡪 Takes a string representing a passenger’s name. It adds the passenger to the end of the seats array, if there is space. It the parameter provided is null, the method will throw IllegalArgumentException with the message “Invalid name”. The method will return a reference to the current object.
5. **equals** method 🡪 Two flight objects are considered equal if they have the same flight number.
6. **compareTo** method 🡪 The method will allow us to sort flights based on number of passengers. If we called Collection.sort() on an ArrayList of Flight objects, the flights with large number of passengers will be displayed first.
7. **iterator()** 🡪 Returns an iterator that allow us to iterate over the seats array. You do not need to implement the remove method.
8. **toString()** 🡪 It returns a string with the flight number, captain’s name and maximum number of seats. See the sample output below for the output format.
9. The sample driver (and output) below can help you verify the functionality of some of the methods described above.

**Answer**

**Total: (75 pts)**

public class Flight implements Comparable<Flight>, Iterable<String> {

 private int flightNumber;

 private String captain;

 private String[] seats;

 private int numberOfPassengers;

 **(12 pts)**

 public Flight(int flightNumber, String captain, int maximumNumberSeats) {

 this.flightNumber = flightNumber;

 this.captain = captain;

 seats = new String[maximumNumberSeats];

 numberOfPassengers = 0;

 }

 **(7 pts)**

 public Flight() {

 this(2, "STAFF", 10);

 }

 **(15 pts)**

 public Flight addPassenger(String name) {

 if (name == null) {

 throw new IllegalArgumentException("Invalid name");

 }

 if (numberOfPassengers < seats.length) {

 seats[numberOfPassengers++] = name;

 }

 return this;

 }

 **(11 pts)**

 public boolean equals(Object obj) {

 if (obj == this)

 return true;

 if (!(obj instanceof Flight))

 return false;

 Flight f = (Flight)obj;

 return this.flightNumber == f.flightNumber;

 }

 **(9 pts)**

 public int compareTo(Flight f) {

 return f.numberOfPassengers - numberOfPassengers;

 }

 **(11 pts)**

 public Iterator<String> iterator() {

 return new Iterator<String>() {

 private int pos = 0;

 public boolean hasNext() {

 return pos < numberOfPassengers;

 }

 public String next() {

 return seats[pos++];

 }

 // Implementing remove was not required

 };

 }

 **(10 pts)**

 public String toString() {

 String answer = "";

 answer += "Flight Number: " + flightNumber + "\n";

 answer += "Captain: " + captain + "\n";

 answer += "Maximum Number Seats: " + seats.length;

 return answer;

 }

}