OOADP/OOSE Re-exam

23 August 2013

Mapping marks onto grades

Answers

1.
a. [4 marks]
The amount of communication required between team members increases (in the worst case) with the square of the number of team members. Whereas the amount of actual work time required by each team member goes down linearly in the best case with the number of team members. This means that increasing the number of team members does not necessarily mean that the amount of time taken to complete a project decreases. Increasing the number of team members generally means that the total number of person-months required to complete the project *increases*, due to the overhead of the extra communication required.

b. [1 mark] option 1
c. A class may extend one superclass[1 mark]. A class may implement any number of interfaces [1 mark].
d. A *component* is a reusable, replaceable module. A module is *loosely coupled* if it does not depend on many other modules. A module is *cohesive* if it cannot easily be broken up into smaller modules. [1 mark for each part]

2. [10 marks for a correct answer, -1 for each error]
-1
-2
-1
0
0
0
0
3
2
2

3.
a. [1 mark each]
calcX(y:int)
calcX
float
private
y:int

b.
i. superclass[1 mark];
ii. 1[2 marks]
c. Inheritance increases coupling because a subclass depends upon its superclass. Increasing inheritance therefore increases the number of dependencies between classes. [2 marks]

4.
a. i. structure; ii. behaviour; iii. behaviour; iv. behaviour. [1 mark each]
b.
i. An actor is a type of user of the system. The user could be a human or a device or any other entity that interacts with the system. [2 marks]
ii. use case is a type of task that the system helps a user to carry out [2 marks]
iii. a scenario is a specific instance of a use case. The outcomes of different scenarios for the same use case may be different. Usually there will be one *main success scenario* for a use case which is the scenario that leads to the user successfully carrying out the task. The use case is typically named after its main success scenario. [2 marks]

5. [2 marks each]
a. non-navigability: Each Square object does not know about the ChessBoard object that contains it.
b. Each ChessBoard object is associated with 64 Square objects.
c. Indicates that the association is a composition in which the ChessBoard object is the container and the Square objects are the contained elements.
d. That each ChessBoard object can access the Square objects that it contains.
e. Composition. This is appropriate because it makes no sense for a Square object to exist in isolation of any ChessBoard and because it should not be possible for a Square object to be contained by more than one ChessBoard.

6. [2 marks each]
a.
1 2
1 2 3

b. So that their constructors can be called directly from the main method without first having to instantiate the Question6 class.

c. Calls the Point class's constructor that takes two integer arguments, defined in lines 7-8. This constructor assigns values to the ThreeDPoint's inherited fields, x and y.

d. this.z refers to the int variable defined in line 12. z refers to the int parameter called z in the ThreeDPoint constructor (line 14).

e. Object.

7. [2 marks each]
a.

Even number!
Odd number!
Even number!
Odd number!

b. Because the Exception class is serializable. Any class that extends a serializable superclass must have a static final integer constant defined called serialVersionUID.

c. The catch blocks in lines 20-23 produce different outputs depending on the type of the exception thrown. This means that they must have different types defined. Each new class must define a constructor with the name of the new class - a new class cannot inherit its superclass's constructor because this has a different name from its subclass.

d. Because if the condition is true in line 18, line 19 is not executed on that iteration of the for loop.

e. Change line 21 to

```
System.out.println("Odd number! ("+i+")");
```

8. [2 marks each]
a. Because it is an anonymous actor whose type is BookBorrower.
b. LibraryMember
c. class
d. It indicates a method returning a value. In this case, it indicates that the okToBorrow() method returns a value that is stored in the variable canBorrow.
e. The actions inside this box are only executed if canBorrow is true.

9. [2 marks each]
a. It is an expansion region. It indicates a part of the Activity diagram that is repeatedly executed for each element in the collection indicated by the list pin box.
b. It is a flow final symbol indicating the termination of activity.
c. It is a list pin box. It indicates a collection of objects over which the actions in the expansion region are iterated.
d. Time signal. When the deadline time is reached, the signal is triggered to emit a token on its output flow.
e. It means that the objects in the collection represented by the list pin box can be processed in parallel.

10.
a.
Output 1:
Y sees 1
X sees 0
[2 marks]

Output 2:
X sees 1
Y sees 0
[2 marks]

b. The thread instantiated in line 25. [2 marks]
c. Because it can throw an InterruptedException. [2 marks]
d. Because there needs to be just one copy of it, belonging to the class, not to any particular instantiation of the Question10 class. It needs to be accessed by both of the threads. Note that the Question10 class is never instantiated. [2 marks]

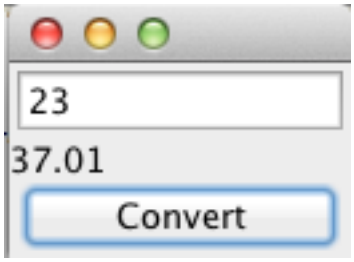
11.
a. TCP is a bi-directional, connection-based protocol with error-correction. It is a reliable protocol. UDP is not connection based and does not have error-correction. It is an unreliable protocol. UDP is faster than TCP because the packets are smaller and there is no error-checking. UDP can be used in applications where reliability is not important and speed is. Examples of such protocols are a time server, video streaming, or ping. TCP should be used where reliability is essential such as ftp or http. [4 marks]

b. [2 marks each]
i. The server program outputs nothing. The client program outputs a message like the following:
Client address and port no.: ./127.0.0.1:<port>
where the port number is dynamically assigned to the client by the operating system.

ii. It is dynamically assigned to the client by the operating system from the range of free dynamic or private ports (49152-65535).

iii. line 14. The server continues when it receives a connection request from a client.

12. [2 marks each]
a.



b. It takes a number from the user indicating a distance in miles, converts this number into kilometres when the user presses the "Convert" button and outputs the result in a label.

c. The ActionPerformed method defines what is done when the Convert button is pressed. When this button is pressed, an ActionEvent event is emitted. The Question12 class acts as an ActionListener which listens fro such ActionEvents and, when one is received, executes its actionPerformed method.

d. Because the Double.parseDouble() method throws a NumberFormatException when the String given to it as an argument cannot be parsed as a floating point value.

e. line 45.