

**PRIFYSGOL CYMRU; UNIVERSITY OF WALES**

**DEGREE EXAMINATIONS JANUARY 2003**

**SWANSEA**

**Computer Science**

**CS 214 Object Technology**  
**external candidate**

**Attempt 2 questions out of 3**

**Time allowed: 2 hours**

**Students are permitted to use the dictionaries provided by the University**

**Students are NOT permitted to use calculators**

**CS\_214**  
**OBJECT TECHNOLOGY**

*(Attempt 2 questions out of 3)*

**Question 1**

(a) Evaluate the way in which Java deals with exceptional circumstances. Include a brief discussion of the way traditional programming languages deal with this problem.

**[10 marks]**

(b) The following section of code is part of an applet to carry out mortgage repayment calculations.

```
1.   import java.applet.*;
2.   import java.awt.*;
3.   import java.awt.event.*;
4.   public class Mortgage extends Applet
5.   {
6.       Button calculate = new Button();
7.       TextField amount = new TextField();
8.       Label lAmount = new Label();
9.       TextField years = new TextField();
10.      Label lYears = new Label();
11.      Label lRepayment = new Label();
12.      TextField repayment = new TextField();
13.      public void init()
14.      {
15.          super.init();
16.          calculate.setLabel("calculate");
17.          calculate.addActionListener(new ActionListener()
18.          {
19.              public void actionPerformed(ActionEvent e)
20.              {
21.                  calculate_actionPerformed(e);
22.              }
23.          });
24.          amount.setText("amount");
25.          lAmount.setText("amount to be borrowed £");
26.          years.setText("years");
27.          lYears.setText("time period");
28.          repayment.setText("repayment");
29.          lRepayment.setText("monthly repayment");
30.          this.add(lAmount);
```

```
31.         this.add(amount);
32.         this.add(IYears);
33.         this.add(years);
34.         this.add(IRepayment);
35.         this.add(repayment);
38.         this.add(calculate);
39.     }
40. }
```

(i) Write the code you would expect to find in the `calculate_actionPerformed` method associated with the `calculateButton`, omitting any code required for data validation and error checking. Assume that the value for annual percentage rate (`apr`) is hard coded into this method, and that the total amount to be repayed can be calculated using the formula

$$\text{total amount repayed} = \text{amount borrowed} * (1 + \text{apr} * \text{period of loan})$$

**[8 marks]**

(ii) Outline the code required to ensure that the input fields contain valid data before the calculations are carried out, and state all assumptions made, e.g. maximum repayment period.

**[7 marks]**

## Question 2

(a) Analyse the additional features found in an object-oriented programming language when compared with more traditional languages. Consider how these features should lead to the development of improved quality software. Include a definition of the object-oriented approach, and discuss the underlying concepts of this approach. Your answer should include examples of object-oriented code to illustrate these differences.

**[18 marks]**

(b) Briefly discuss the Java solution used to overcome the limitations of single inheritance which could result in the need to duplicate methods across classes.

**[7 marks]**

### Question 3

(a) Briefly evaluate the role of UML in the development of a standard for object-oriented analysis and design. Consider the need for modelling of systems in your answer, and include brief descriptions of some of the major diagrams used in UML.

[9 marks]

(b) A system is required to record and monitor the progress of transactions for an on-line bookstore. The process of making an on-line purchase begins when a customer submits a request to the bookstore containing the following information

- selected book
- name
- address
- credit/debit card details

This information is handled by a number of other computer systems and company staff. The stock database is checked to ensure the availability of the selected book. A customer database is updated either by adding the details of a new customer, or modifying the records of an existing customer. A credit checking agency is employed to check the credit/debit card details. Company staff can monitor the transaction and update its status.

(i) Produce a use case diagram to illustrate the relationship between the system and its environment.

[8 marks]

(ii) Produce an activity diagram illustrating the process of purchasing a book.

[8 marks]