

**PRIFYSGOL CYMRU; UNIVERSITY OF WALES**

**DEGREE EXAMINATIONS MAY/JUNE 2002**

**SWANSEA**

**Computer Science**

**CS 214 Object Technology**

**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) The Unified Process (UP) has been described as an iterative and incremental lifecycle. Analyse this description, and evaluate the importance of UP to the development of the object-oriented approach. What is the role of the baseline in this approach? Include a description of the phases and workflows associated with UP in your answer, and consider the role of the Unified Modelling Language (UML).

**[18 marks]**

(b) Outline the role of design by contract to the design of software, and indicate how UML supports this concept.

**[7 marks]**

**Question 2**

(a) Explain in detail the Java solution used to overcome the limitations of single inheritance that could result in the need to duplicate methods across classes. Identify these limitations and illustrate your answer with Java code.

**[10 marks]**

(b) The following section of code is part of an applet to carry out conversions of quantities from one measurement unit to another, e.g. gallons to litres.

```
1.    import java.awt.*;
2.    import java.awt.event.*;
3.    import java.applet.Applet;
4.    public class Converter extends Applet implements ActionListener
5.    {
6.        public Choice fromUnit;
7.        public Choice toUnit;
8.        public TextField amount;
9.        public TextField quantity;
10.       private Label fromLabel;
11.       private Label toLabel;
12.       private Label factorLabel;
13.       private Label resultLabel;
14.       private Label amountLabel;
15.       private Label quantityLabel;
16.       private Button calculateButton;
17.       private Factors table;
```

```

18.     public void init()
19.     {
20.         setLayout(new FlowLayout());
21.         fromUnit = new Choice();
22.         toUnit = new Choice();
23.         quantity = new TextField();
24.         fromUnit.addItem("centimeters");
25.         fromUnit.addItem("meters");
26.         fromUnit.addItem("kilometers");
27.         fromUnit.addItem("litres");
28.         fromUnit.addItem("grammes");
29.         fromUnit.addItem("kilogrammes");
30.         toUnit.addItem("inches");
31.         toUnit.addItem("yards");
32.         toUnit.addItem("miles");
33.         toUnit.addItem("gallons");
34.         toUnit.addItem("ounces");
35.         toUnit.addItem("pounds");
36.         fromLabel = new Label("From:");
37.         toLabel = new Label("To:");
38.         quantityLabel = new Label("Enter quantity to be converted : ");
39.         add(fromLabel);
40.         add(fromUnit);
41.         add(toLabel);
42.         add(toUnit);
43.         add(quantityLabel);
44.         add(quantity);
45.         calculateButton = new Button("Convert");
46.         add(calculateButton);
47.         factorLabel = new Label("The conversion factor is");
48.         add(factorLabel);
49.         resultLabel = new Label("The equivalent quantity is : ");
50.         add(resultLabel);
51.         table = new Factors();
52.         calculateButton.addActionListener(this);
53.     }
54. }

```

(i) Write the code you would expect to find in the actionPerformed method associated with the calculateButton.

**[9 marks]**

(ii) Describe the content required of the user-defined class referred to in the section of code shown above.

**[6 marks]**

### Question 3

(a) Evaluate the role of use case diagrams in the development of software systems. Identify the elements that make up such diagrams, and outline the relationships and associations that can exist between them.

[10 marks]

(b) An automatic teller machine (ATM) within a bank system allows customers to access their account details and carry out transactions. The customer is able to withdraw cash (a limit to the daily amount that can be withdrawn is enforced), check the account balance, and deposit money. The ATM is also used by bank staff to monitor the usage of the system, printing reports of transactions and checking that cash is available to be dispensed. Finally, the ATM is connected to the bank's computer system, so that transactions are checked to ensure that the customer's ATM card and PIN (personal identification number) are valid and that sufficient funds are available to satisfy the customer's request.

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

[7 marks]

(ii) Produce a sequence diagram to illustrate the sequence of events that take place and the messages that are exchanged when a customer withdraws cash via an ATM.

[8 marks]