

BLG411E - Software Engineering

Final Exam

12.01.2010

- Books/notes are closed • Dictionaries are allowed
- Exam duration is 1.5 hours
- Write your answers on blank Answer Sheets only
- Please write your answers NEATLY.

QUESTION 1 [40 points]

Consider a fuel station automation software is required. The automation system will keep track of fuel tanks, personnel, pumps, customers, sales and will prepare appropriate reports. The following data are necessary to be kept by the system.

TANKS : TankNumber, Fuel Type, Capacity, Current Level

PERSONNEL : ID, Name, Blood Type

CUSTOMER : ID, Name, Address

PUMPS : Pump Number, Serial Number, Connected Tank

SALES : ID, Sales Date and Time, Amount, Personnel ID, Customer ID, Pump Number

The following system functions are also requested:

- CRUD (Create-Read-Delete-Update) operations for all type of information
- After each sale, a “sales receipt” must be printed
- Each sale is initiated by the identification of the personnel by a special hardware (smart card, touch button etc.)
- Registered customers should present their identity by means of a special hardware before the refill
- System should allow fuel sales for unregistered customers
- Manager of the station requires a daily sales report in the end of shifts
- Only the manager can set the new prices in the pump machine (by means of the automation system)

a) [10 points] Draw UML Use Case Diagrams.

b) [20 points] Draw UML Class Diagrams (attributes, methods, and relationships).

c) [10 points] Draw UML Sequence Diagram for “sale”.

QUESTION 2 [40 points]

Please answer the following questions.

a) [10 points] What is the difference between the incremental and iterative process models?

b) [10 points] Explain the Software Engineering Institute’s Capability Maturity Model (CMM) levels.

c) [10 points] What is the difference between validation and verification?

d) [10 points] What are the six stages of testing? Please list them in order.

QUESTION 3 [30 points]

Please answer the these questions based on the following function “**calculate**”.

- a) [10 points] Draw the corresponding Flow Graph.
- b) [10 points] Calculate cyclomatic complexity $V(G)$ and write all independent paths.
- c) [10 points] Prepare the test cases for basis path testing.

```
1 public double calculate(int amount)
2 {
3     double rushCharge = 0;
4     if (nextday.equals("yes") )
5     {
6         rushCharge = 14.50;
7     }
8     double tax = amount * .0725;
9     if (amount >= 1000)
10    {
11        shipcharge = amount * .06 + rushCharge;
12    }
13    else if (amount >= 200)
14    {
15        shipcharge = amount * .08 + rushCharge;
16    }
17    else if (amount >= 100)
18    {
19        shipcharge = 13.25 + rushCharge;
20    }
21    else if (amount >= 50)
22    {
23        shipcharge = 9.95 + rushCharge;
24    }
25    else if (amount >= 25)
26    {
27        shipcharge = 7.25 + rushCharge;
28    }
29    else
30    {
31        shipcharge = 5.25 + rushCharge;
32    }
33    total = amount + tax + shipcharge;
34    return total;
35 }
```