RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree
Second Year Semester I Examination February/March 2013

COM 2302–OBJECT ORIENTED PROGRAMMING

Answer All Questions Time:3 hours

01.

(a) Explain the following Object Oriented Programming (OOP) concepts using java code/code segments as examples.

(i) Inheritance

(ii) Dynamic binding

(iii) Message Communication

[3x3 marks]

(b) State two disadvantages of OOP.

[1 marks]

(c) Read the question carefully.

(i) Create two subclasses for the "Employee" class (Figure 1). "Assembler" is an employee who **assembles** the components together and **packages** the final product. "Manager" is also an employee who will allocate work, write reports and supervise his department. Write methods to describe these actions (methods do not need to have complex implementations inside them). Use inheritance when creating the classes.

[5 marks]

(ii) The fields in the "Employee", "Assembler" and "Manager" classes are exposed to the outside world. Rewrite the "Assembler" and "Manager" classes according to the OOP encapsulation principle.

[5 marks]

```
class Employee
{
stringimployeeID ;
stringjobTitle;
string department;
void work()
{
System.out.println("Work");
}
}
```

Figure 1

(d) Draw a class diagram for the class hierarchy that you created in above (c) (i) & (c) (ii) questions.

[5 marks]

(e) Draw the object structures for the "Assembler" class and the "Manager" class according to UML notation.

[2.5x 2 marks]

02.

(a) Explain the differences between the abstraction and polymorphism using examples.

[5 marks]

(b) A branch of a bank has the following two job positions. There can be more than one person in the same job position.

- Manager
- Teller
- Management Assistant

The teller is an employee who deals with the transactions of the customers such as deposits, withdrawals, cashing checks, transfers. Management Assistant deals with the customers by opening and closing accounts,

giving loans. They can view in to account details of the customers but can't alter the amounts in the accounts. Manager supervises the work of the Tellers and management assistants. Manager can look in to the transactions of the branch, account details but he can't alter any information. Manager may also directly deal with customers with important matters.

All of the personal in the above three job positions are employees of the bank. They have an employee ID, job Title, Branch ID to in their personal information.

First create an "Employee" class which would act as a super class for all other employees. Then create "Manager", "Teller" and "Management Assistant" classes as the sub classes. Write methods to describe the behavior of each of them (Methods do not need to have complex implementations inside them). Use OOP concepts accordingly.

[10 marks]

(c) Explain what is a model (of a system) and state three reasons why we should create models before implementing the actual system?

[5 marks]

03.

(a) With regard to the bank branch scenario in 02 (b) there is a Bank wide computer system that that manages the functionality of the bank. All bank employees need to login to the system using their Employee ID and a password before starting their work. They can login to the system only from their branch. The system gives each employee the necessary access to do their daily functions.

Draw a use case diagram to describe the above bank wide system. It's enough only to describe the **all went well** scenario. State the lists of pre-conditions and post-conditions related to the scenario.

[10 marks]

(b) The bank has a separate Automatic Teller Machine (ATM) network that allows the customers to do some transactions such as withdrawing money and checking balance in their account.

To do that they need to use an ATM card, insert PIN (Personal Identification Number), choose the transaction type (withdraw or balance check), indicate an amount if they are withdrawing and end the transaction and take the card out. This ATM network is connected to bank wide network described above. Transactions being made through ATMs are happening in real time to the actual customer accounts. If the customer does not have the necessary amount in his account for the withdrawal, the amount in his account will be displayed and customer will be given the option to end the transaction or input a new amount. The customer can cancel the transaction and remove the card before the money is obtained. If the customer enters a wrong PIN, he would have three chances to enter it correctly. If he exhausts his three chances he would be locked out of the ATM network for a half an hour.

Draw an activity diagram to describe the above ATM system.

[10 marks]

04.

(a)

(i) State four features of the object oriented paradigm.

[2 marks]

(ii) Explain three advantages of OOP in your own words.

[3 marks]

(b)

(i) Constructors do not specify a return type or a void key word. But do constructors return something when they are called? If they do, what do they return?

[2 marks]

(ii) If your class implements an interface, you need to override all the methods in the interface in your classes. Is there a way for a class to implement an interface but avoid overriding all the methods in the interface?

If class does this (implement an interface but avoid overriding all the methods in the interface) what are the difficulties that you would face when you are using that class?

[3 marks]

(iii) Explain **forking, joining** and **synchronization bar** in activity diagrams using graphical examples.

[3 marks]

(iv) Explain the use of interaction diagrams and what is shown through interaction diagrams?

[2 marks]

05.

(a)

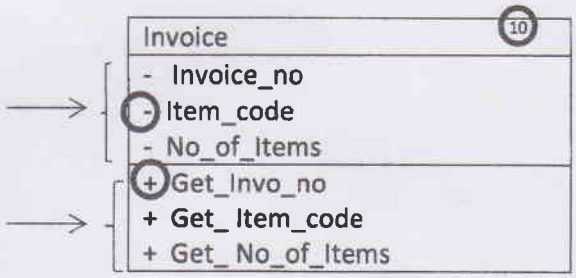
(i) Explain the three main types of relationships among classes in UML. Include the graphical notations used to denote these relationships.

[3 marks]

(ii) Explain the use of multiplicity in a relationship among classes.

[2 marks]

(b) Bellow is graphical representation of a structure of a class in a class diagram. The name of the class is "Invoice". Label the other components of it (components which needs to be labeled are indicated with arrows or circles) and describe what they mean.



[5 marks]

(c)

(i) What is the purpose of a state machine?

[1 marks]

(ii) What is the purpose of a component diagram? What is considered as a component in component diagrams?

[2 marks]

(iii) What is an **interface** in a component diagram (in UML)?

[1 marks]

(iv) What is the main difference between component and node in UML?

[1 marks]