IVE Information Technology

Information & Communications Technology Programme Board

Instructions:

(a) This paper has a total of SIX pages including the covering page.

(b) This paper contains TWO Sections.

(c) Answer ALL questions in ALL sections.

Note: The result of this assessment will not be counted if you do not meet the minimum attendance requirement (if any) governed by the general academic regulations of your programme/course unless approval of the campus principal has been granted.

HIGHER DIPLOMA IN

SOFTWARE ENGINEERING
(IT114105)

GAME SOFTWARE DEVELOPMENT
(IT114107)

COMPUTER SYSTEMS ADMINISTRATION
(IT124106)

MODULE TITLE:

OBJECT-ORIENTED TECHNOLOGY

MODULE CODE: **ITP4909**

SEMESTER TWO
MAIN EXAMINATION

11 MAY, 2016
1:30 PM TO 3:30 PM (2 hours)

Section A (40 marks)
This section contains THREE questions.

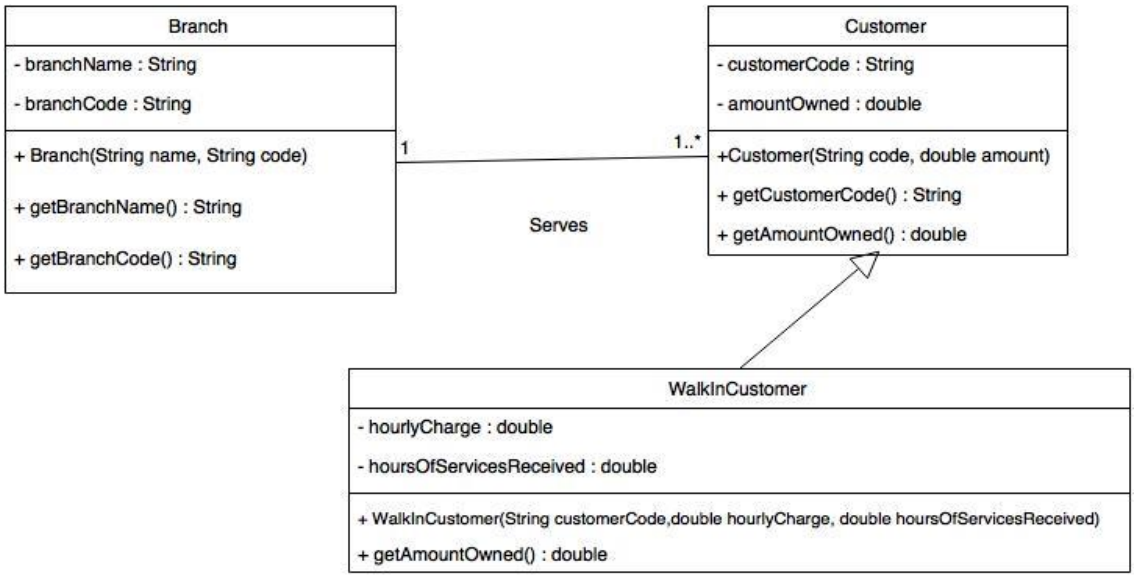
Answer ALL questions.

A1. Consider the following scenario:

A pet shop offers many pets to its customers. A pet will have a code, and a nick name. There are two types of pets that the shop is currently selling: dogs and cats. For a dog, it must be trained by one and only one dog trainer while a single trainer must train one or more than one dog at the same time. As for the cats, they will not be trained. A trainer will have a unique id. A customer of the pet shop is allowed to purchase as many dogs and cats he / she wants, and he / she will not be considered as a customer until he / she purchased at least one pet from the shop. On the other hand, a pet will not have an owner before it is sold, and it can be sold to a single customer only. Before a pet leaves the shop, as part of the pet, a chip that can be used to record the name of the customer will be implanted into the pet. Therefore, a chip must belong to one and only one pet; while a pet will have no chip when it is still in the store, it must have one and only one chip after it is sold.

Draw a class diagram to model the relationships among the classes in the system. You are required to show the name and multiplicity of each association (including generalization/specialization, composition/aggregation) in your diagram. All attributes that can be found in the problem statement should also be included in your classes.
Note: You **do not need to** add association classes for this question. [9 marks]

A2. Consider the given following class diagram and the test program **Test.java**



QUESTION A2 CONTINUES ON THE NEXT PAGE

QUESTION A2 CONTINUES FROM THE PREVIOUS PAGE

```
import java.util.*;
import projectAPI.*;

public class Test {

		public static void main(String[] args) {
		    double a = 0;
		    int c = 0;
		    Branch branch1 = new Branch("Branch A", "B001");
		    Branch branch2 = new Branch("Branch B", "B002");

		    Customer c1 =   new Customer("C001", 1550);
		    Customer c2 =   new Customer("C002", 1300);
		    Customer c3 =   new Customer("C003", 450);
		    Customer c4 =   new Customer("C004", 1200);
		    Customer c5 =   new WalkInCustomer("C005", 500, 3);

		    branch1.addCustomer(c1);
		    branch1.addCustomer(c2);
		    branch1.addCustomer(c5);

		    branch2.addCustomer(c3);
		    branch2.addCustomer(c4);
		    // The addCustomer method is a method in the Branch class
		    // It is used to add a customer to a branch

		    c1.setBranch(branch1);
		    c2.setBranch(branch1);
		    c5.setBranch(branch1);

		    c3.setBranch(branch2);
		    c4.setBranch(branch2);
		    // The setBranch method is a method in the Customer class
		    // It is used to set the branch for a customer

		    Enumeration e = branch1.getCustomers();
		    // The getCustomers method is a method in the Branch
		    // It is used to return a set of customers from a branch

		    while (e.hasMoreElements())
		    {
		        c++;
		        a = a + ((Customer) e.nextElement()).getAmountOwned();
		    }

		    System.out.println("Average owned amount for " + branch1.getBranchName()
		+ " is " + a / c);

		}

}
```

QUESTION A2 CONTINUES ON THE NEXT PAGE

QUESTION A2 CONTINUES FROM THE PREVIOUS PAGE

Assume that for a walk-in customer, the amount he / she owned is computed by using the following formula:

amountOwned = hourlyCharge * hoursOfServiceReceived

(a) Now, the class ***WalkInCustomer*** has been completed by your teammate. Implement the classes ***Branch*** and ***Customer*** with Java programming language. [14 marks]

(b) Assume that you have successfully implemented all the classes in the given class diagram, give the expected output when the test program ***Test.java*** runs. [2 marks]

A3. The IVE Alumni Scholarship (IVEAS) is developing an application system for eligible students to apply scholarships through its website.

Any student can apply for scholarships using the application system at IVEAS website after logging in. The application process starts when an applicant enters his/her student number for checking his/her study status. If the applicant is not a current IVE student in any Higher Diploma course, he/she will be rejected in this application and the process will be terminated. On the other hand, if the applicant is a current student of a Higher Diploma course, the system will ask the applicant to enter his/her academic qualifications. The system will check the applicant's academic qualifications. If the applicant cannot meet the minimal requirements, the system will end the process immediately. If the applicant meets the minimal requirements, the system will display a list of suitable scholarships for him/her. The applicant must immediately select one of the scholarships. If the applicant selects a scholarship, the system will show the interview time and venue. If the applicant declines any scholarship by pressing cancel button, the system will terminate the application process.

(a) Draw an activity diagram for an applicant to apply for a scholarship using the application system at IVEAS website. You should include the initial node, final node, the name of each activity, the decision node, and each transition in your state diagram. [8 marks]

(b) Draw a state machine diagram for the applicant to apply for a scholarship using the application system at IVEAS website. You should include the initial state, final state, the name of each state, the event, and guard condition (if any) in each transition in your state diagram: [7 marks]

Section B (60 marks)

This section contains THREE questions.
Answer ALL questions.

The problem statement for the questions in Section B.

Ms. Candy is a famous baker. She wants to develop an Online Cake Shop System (OCSS) to promote and sell her cakes. A public user or member can browse for the cakes provided in the online shop and no login is required. He/she can search for the cakes by entering either category or keywords. A list of cakes which match with the search criteria will be shown.

Before a public user can make an order, he/she should register as a member by providing his/her name, email address, mobile phone number and home address. Upon successful registration of membership, a confirmation email will send back to the user with unique member number and a password.

A member can make an order after selecting a suitable cake by pressing the "Place Order" button. The system will ask for the details of an order. The member enters the details of an order such as weight of cake with unit in pound, number of candles required, and greeting words on the chocolate plate. After the member press the "Submit" button, the system asks the member to login his/her account by entering member number and password.

The amount is calculated by the ***price of cake per pound*** x ***weight – value of e-coupon used***. If the total amount of an order exceeds $800, the system will issue an e-coupon value at $50 for member to use when ordering next time. The payment is done by credit card and the system will ask the member to enter the credit card number, card type and expiry date. The system forwards the payment amount together with the credit card details to an external payment gateway for processing. Upon successful approval of the credit card payment, the payment gateway sends back an approval code to the system. The system then shows an order number and the payment approval code to the member.

A member can use the system to browse the status of his/her order after logging in. The staff of the shop can use the system to browse all orders after logging in his/her account.

Answer questions B1 to B3 on the next page based on the given problem statement.

B1. Draw a use case diagram for the Online Cake Shop System (OCSS). Show all use cases, actors, communication links between actors and use cases, and <<include>> / <<extend>> relationships between use cases. [20 marks]

B2. (a) Perform a textual analysis on the problem statement to identify candidate classes of OCSS. List the candidate classes with the corresponding reasons for the choices of the candidate classes. [8 marks]

(b) Draw an initial class diagram to show the classes of OCSS. Show the relationships among classes in your answer. Give appropriate names to associations.
You are NOT required to show multiplicities on associations, attributes/methods of classes, or any association class. [6 marks]

B3. (a) Assuming the member has not logged in OCSS, write the flow of events for the ***Place Order*** use case.
(Assuming the sequence starts with the pressing of "Place Order".) [5 marks]

(b) Draw a system level sequence diagram to illustrate the scenario that a member places an order successfully through the system. [6 marks]

(c) Draw a three-tier (Model-View-Controller) sequence diagram for the system level sequence diagram that you have for the answer of B3 part (b).

For simplicity, only one user interface (UI) object and one controller object are required for your design. [15 marks]

******* END OF PAPER *******