Instructions:

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

(b) This paper contains TWO Sections.

(c) Section A is WORTH 40 marks and Section B is worth 60 marks.

(d) Answer ALL questions in Section A.

(e) Answer ALL questions in Section B.

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.

IVE Information Technology

Information & Communications Technology Programme Board

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

12 MAY, 2015

1:30 PM TO 3:30 PM (2 hours)

This paper contains <u>TWO</u> sections.

Section A (40 marks)
This section contains <u>THREE</u> questions. Answer <u>ALL</u> questions.

A1 A kindergarten offers playgroup classes for kids. The kindergarten has decided to develop a playgroup management system for supporting the running of playgroup classes. A playgroup class is described by its title and description. A playgroup class has one or more sessions. One classroom is assigned to a playgroup class for holding session(s). A classroom can be assigned to zero or more playgroup classes. Each session is scheduled at a date and time. A classroom is identified by its location. Each class is taught by three teachers. Each teacher can teach zero or more classes. Each class has at least one student and up to twenty four students. One senior teacher supervises two junior teachers. A junior teacher is paid by a monthly salary and overtime allowance. A senior teacher is paid by a monthly salary and bonus. Each student can enrol to one or more classes. Teachers and students are called by their names.

Draw a class diagram to model the classes and the relationships between classes for the above problem statement. You are required to show the name and multiplicity of each association in your diagram. You need to show all the required attributes in each class based on the given information. You should also structure the classes with inheritance if possible.

Note: You **do not need** to add association classes for this question. [13 marks]

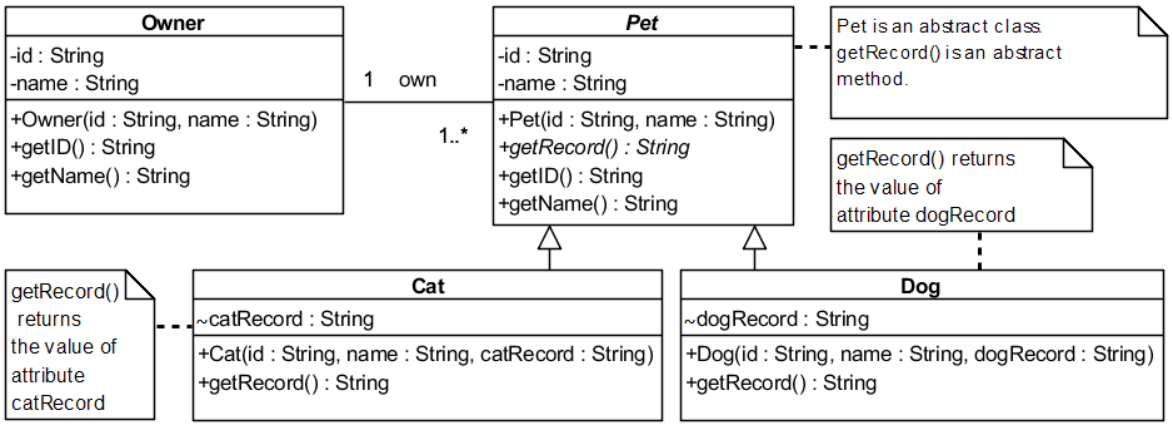
A2 A lottery company has decided to develop a system for selling electronic lottery tickets. A customer can buy a lottery ticket using the system by the following procedure:

Initially, the system displays a list of lottery tickets of different prices. The customer selects a lottery ticket. The system asks the customer to select a payment method: credit card payment or PPS payment. The customer selects a payment method. If the customer has selected credit card payment, the system asks the customer to enter credit card information and the customer enters the card information. If the customer has selected PPS payment, the system asks the customer to enter PPS account number and password and the customer enters the PPS account number and password. If the payment is approved by an external payment gateway, the system displays the lottery ticket and a download button. The customer clicks the download button to download the lottery ticket and the procedure is terminated. If the payment is not approved by an external payment gateway, the system asks the customer to select the payment method again and the above steps for handling payment are repeated.

(a) Draw an activity diagram to model the procedure for a customer to buy a lottery ticket using the system. [6 marks]

(b) Draw a state machine diagram to model the procedure for a customer to buy a lottery ticket using the system. Show the name of each state, the event and the guard condition (if any) in each transition in your diagram. Your diagram should include the initial state and final state. [6 marks]

A3 Given the following class diagram and the test program **PetClinic.java**:



PetClinic.java:

```
import java.util.*;

public class PetClinic {
  public static void main(String[] args) {
      Owner[] cList = new Owner[2];
      cList[0] = new Owner("Owner01","Mary");
      cList[1] = new Owner("Owner02","John");
      Pet[] pets = new Pet[3];
      pets[0] = new Cat("PET01", "Lucky","CAT: First visit");       //CAT
      pets[1] = new Cat("PET02", "Dicky","CAT: First visit");        // CAT
      pets[2] = new Dog("PET03", "Luci","DOG: First visit");        //DOG
      cList[0].addPet(pets[0]);                    pets[0].setOwner(cList[0]);
      cList[0].addPet(pets[1]);                    pets[1].setOwner(cList[0]);
      cList[1].addPet(pets[2]);                    pets[2].setOwner(cList[1]);
      Owner theOwner = cList[0];
      Enumeration petList = theOwner.getPets();
      //  getPets method in class Owner is to find  and return all Pets of the Owner
      System.out.println("The list of Owner "+theOwner.getName()
            +" ( "+theOwner.getID()+" ) own pets:-");
      while (petList.hasMoreElements()) {
         Pet thePet = (Pet) (petList.nextElement());
         System.out.println(thePet.getID() + ", Name: " + thePet.getName()
                  + ", Record: " + thePet.getRecord());
      }
   }
}
```

Based on the given class diagram and the test program **PetClinic.java**, implement the classes *Owner*, *Pet* and *Cat* in Java.

Note: Apart from the attributes and methods to classes *Owner*, *Pet* and *Cat*, it may be necessary to add attributes and methods to classes *Owner*, *Pet* and *Cat* for implementing the one-to-many association and the basic getters/setters. [15 marks]

Section B (60 marks)

This section contains THREE questions.
Answer ALL questions from this section.

The problem statement for the questions in Section B.

Pet Sitter Service Company is a pet care company to provide in-home pet sitting services for pet owners. The company is now going to develop a Pet Sitter Service System (PSSS) to streamline its operation of the company.

A public user or a customer can use PSSS to browse for the services provided by the company. There are two types of service available in PSSS, namely Cat Sitting and Dog Sitting. The Cat Sitting Service includes fresh food and water, cleaning of feeding area and bowls, cleaning of litter box, playing time and updating pictures. The Dog Sitting Service includes the daily walking for 30 minutes, 45 minutes or 60 minutes and all items covered by the Cat Sitting Service except playing time.

Before a public user can make an appointment for pet care, he/she should register a customer account by entering his/her name, address, mobile phone number and email address in the online registration form by using PSSS. PSSS sends back a confirmation email with password to the registered customer.

A customer can make an appointment through PSSS by selecting a suitable service. PSSS asks for the details of new appointment. The customer enters the details of the pet such as name, breed, age, behaviour problem and health condition and the dates, timeslots, any special instructions of the appointment. PSSS asks the customer to login his/her account by entering email address and password. After login, PSSS asks the customer to pay the service by credit card. The customer enters the credit card number, card type and expiry date. PSSS 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 PSSS. PSSS then shows an appointment number and the payment approval code to the customer.

A customer can use PSSS to browse his/her appointments after logging in his/her account. The manager of the company can use PSSS to browse all appointments after logging in his/her account. A manager can use PSSS to assign an appointment to a pet sitter by browsing and selecting an appointment and selecting the pet sitter of the selected appointment. A manager supervises one or more pet sitters and one pet sitter is supervised by one manager.

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

B1 (a) Draw a use case diagram for the Pet Sitter Service System. Show all use cases, actors, communication links between actors and use cases, and <<include>> / <<extend>> relationships between use cases. [16 marks]

(b) Define the term "base use case" in 1 to 2 sentences. [1 mark]

(c) Define the term "abstract use case" in 1 to 2 sentences. [1 mark]

(d) Name ONE "base use case" and ONE "abstract use case" from your answer to question B1 part (a). [1 mark]

B2 (a) Perform a textual analysis on the problem statement to identify candidate classes of the Pet Sitter Service System. List the candidate classes with the corresponding reasons for the choices of the candidate classes. [9 marks]

(b) Draw an initial class diagram to show the classes of the Pet Sitter Service System. Show the associations and generalization among classes in your answer. Give appropriate name and show the multiplicities to associations. Attributes/methods of classes and association classes are NOT required to be shown. [12 marks]

B3 (a) Write the flow of events for the ***Make Appointment*** use case. [5 marks]

(b) Draw a three-tier (Model-View-Controller) sequence diagram for the normal scenario of the ***Make Appointment*** use case. For simplicity, only ONE user interface object and ONE controller object are required for your design. [15 marks]

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