

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)**

MODULE TITLE:

**OBJECT-ORIENTED
TECHNOLOGY**

MODULE CODE: **ITP4909**

**SEMESTER TWO
MAIN EXAMINATION**

**18 MAY, 2017
1:30 PM TO 3:30 PM (2 hours)**

Section A (40 marks)

This section contains THREE questions.

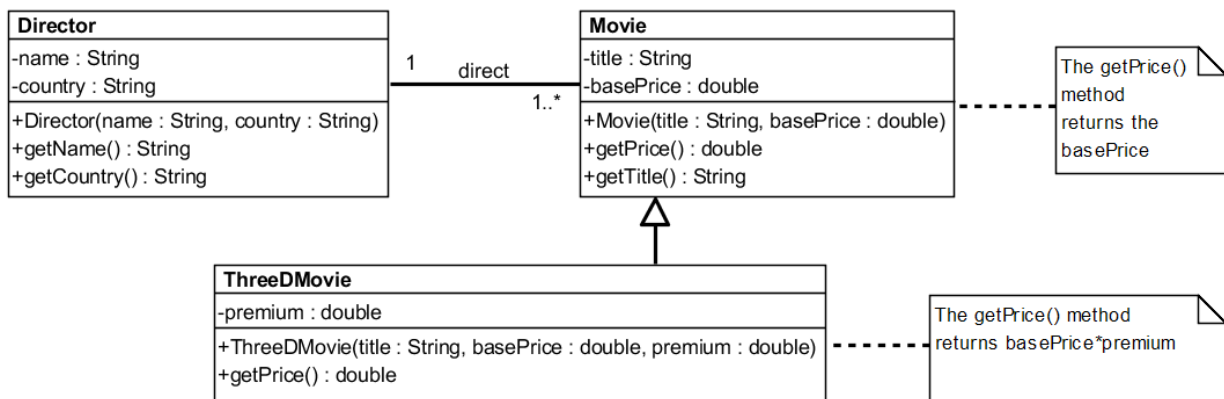
Answer ALL questions.

A1. A car company provides an online system to allow customers with smartphones to submit a trip order with location. The system automatically sends the order to a company driver nearest to the customer’s location and alerts the driver to handle the order. The customer is identified by his/her phone number. There are two types of drivers, day drivers and night drivers. A driver is identified by his/her name and paid by monthly salary. A day driver has a bonus after he/she handled a specified number of orders. A night driver has a night allowance. A driver may be assigned to drive different cars on different days and a car may also be assigned to different drivers. Each car has a licence number. A car has a card reader installed. A driver needs to tap his staff card on the card reader at the beginning and the end of driving a car. A card reader has a unique ID for identification.

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



QUESTION A2 CONTINUES ON THE NEXT PAGE

QUESTION A2 CONTINUES FROM THE PREVIOUS PAGE

```
import java.util.*;

public class TestDriver {

    public static void main(String[] args) {

        Director director1 = new Director("Peter Dixon", "UK");
        Director director2 = new Director("John Chan", "China");

        Movie m1 = new Movie("Pacific Wars", 80.0);
        Movie m2 = new ThreeDMovie("Three Kingdoms", 90.0, 1.5);
        Movie m3 = new ThreeDMovie("Star Journey", 75.0, 2.0);
        Movie m4 = new Movie("My True Love", 90.0);
        Movie m5 = new ThreeDMovie("Future Wonderland", 80.0, 1.5);

        // add Movies m1, m3 and m5 to director1.
        director1.addMovie(m1);
        director1.addMovie(m3);
        director1.addMovie(m5);

        // add Movies m2 and m4 to director2.
        director2.addMovie(m2);
        director2.addMovie(m4);

        // set the director of Movies m1, m3 and m5 to director1
        m1.setDirector(director1);
        m3.setDirector(director1);
        m5.setDirector(director1);

        // set the director of Movies m2 and m4 to director2
        m2.setDirector(director2);
        m4.setDirector(director2);

        // get the movies of director1
        Enumeration e = director1.getMovies();
        int count = 0;
        while (e.hasMoreElements())
        {
            if (((Movie) e.nextElement()).getPrice() > 100.0)
                count++;
        }
        System.out.println("Director " + director1.getName() + " has " + count
            + " movie(s) with price > 100.0");
    }
}
```

Implement the classes *Director*, *Movie* and *ThreeDMovie* in Java.

[12 marks]

Note: Apart from the attributes and methods specified in the class diagram, it may be necessary to add attributes and methods to classes *Director* and *Movie* for implementing the one-to-many association.

- A3.** A college has decided to develop a system for the application of module exemption and credit transfer. Students can apply module exemption and/or credit transfer using the application system at the college's website.

Initially, the system requires student to login with their student ID and password. When a student enters his/her student ID and password to login the system, the system checks the status of the student and displays a list of modules eligible for the student to select. The student selects a module from the list. The system asks the student to select the type of application: credit transfer or module exemption. The student then selects the type of application. If the student has selected credit transfer, the system asks the student to enter the identical module previously completed. The student then enters the identical module previously completed. If the student has selected module exemption, the system asks the student to enter the comparable academic achievement. The student enters the comparable academic achievement. The system requires the student to upload relevant certificate(s) and supporting documents for credit transfer or module exemption. The student then uploads the relevant certificates and supporting documents. The system asks the student if he/she would like to apply another module. If student clicks "Yes" button, the system will ask the student to select another module from the list again and the above steps for application are repeated. The student clicks "No" button to terminate the application.

- (a) Draw an activity diagram to model the procedure for the student to apply for module exemption and/or credit transfer using the application system at the college's website. You should include the initial node, final node, the name of each action state, the decision node (if any), and each transition in your activity diagram. [8 marks]
- (b) Draw a state machine diagram to model the procedure for the student to apply for module exemption and/or credit transfer using the application system at the college's website. You should include the initial state, final state, the name of each state, the event, guard condition (if any), and actions performed when the transition is fired in each transition in your state machine diagram. [7 marks]

Section B (60 marks)

This section contains **THREE** questions.

Answer **ALL** questions.

The problem statement for the questions in Section B.

UniqueCase is an online company that makes and sells personalized phone cases. UniqueCase is currently developing a web-based Phone Case Order System (PCOS), which allows customers to order personalized phone cases online.

Before a customer orders his/her personalized phone case, he/she has to register as a PCOS member by providing his/her name, email address, mobile phone number and delivery address. Upon successful registration of membership, a confirmation email with password will be sent to the user.

To order a personalized phone case, a PCOS member can access UniqueCase's website and click the "Create My Case" button to start the order process. PCOS displays a list of phone models with brands for the member to choose. The member selects the phone model. PCOS displays over 500 different background patterns with prices for choosing to be printed on the phone case. The member selects the background pattern of the phone case. The system asks the member to choose whether to upload a photo as a part of the background. If the member uploads a photo, the system adds an extra charge and displays the price of the phone case. Lastly, if the customer satisfies with the phone case, he/she can select "Order My Case". PCOS then asks the member to login his/her account by entering email address and password. After successful login, PCOS shows the total amount of the phone case and asks for credit card details for payment. The customer enters the credit card number, card type and expiry date. PCOS then sends the credit card information and payment details to an external payment gateway for approval. Upon successful approval of the credit card payment, the payment gateway sends back an approval code to PCOS. Then PCOS displays the order number to the member.

The staff member of UniqueCase gets the phone case order after logging into PCOS. Then, the staff member makes the phone case of the order. After the phone case is made, the staff member packs the phone case in a box and updates the order status as "packed". The system sends a message to an external delivery agent for the collection and delivery of the order. The delivery agent then collects the packed order from UniqueCase and delivers it to the member. The delivery agent notifies the completion of delivery of order by sending a message to PCOS after logging into PCOS.

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

- B1.** Draw a use case diagram for the Phone Case Order System (PCOS). 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 the candidate classes of the PCOS. List the candidate classes with the corresponding reasons for your choices. [7 marks]
- (b) Draw an initial class diagram to show the classes of the PCOS. Show the relationship among the classes in your answer. Give appropriate names to the associations.
Note: You are NOT required to show the attributes/operations of the classes in your diagram and also the navigability and multiplicities of the associations. [6 marks]
- B3**
- (a) Write the flow of events for the **Order Phone Case** use case. (Assuming the sequence starts with clicking the “*Create My Case*” button.) [8 marks]
- (b) Draw a system-level sequence diagram for the scenario in which a member successfully orders a phone case with a member’s photo using the PCOS. [9 marks]
- (c) Draw a three-tier (Model-View-Controller) sequence diagram for the system-level-sequence diagram in your answer to B3 (b).
Note: For simplicity, only one user interface (UI) object and one controller object are required for your design. [10 marks]

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