Sri Lanka Institute of Information Technology

B. Sc. Special Honours Degree/ Diploma
in
Information Technology

Final Examination
Year 1, Semester 2 (2017)

IT1050 – Object Oriented Concepts

Duration: 2 Hours

Instructions to Candidates
- This paper has **Four** questions. Answer all questions
- Total Marks is 100.
- There are 6 pages with the cover page.

Question 01 (35 marks)

a) List two differences between Structured Programming and Object Oriented Programming

(2 marks)

b) Briefly explain the following terms with examples (6 marks)
   a) Object
   b) Encapsulation
   c) Polymorphism

c) List two advantages you can gain by developing a program using Object Oriented Concepts (2 marks)

d) List three classes which can be implemented for a Vehicle Hiring System. (3 marks)

e) Represent the following class in UML Notations (6 marks)

```
class Student
{
    private :
         int studentNo;
         char name[20];

    public :
         int marks[3];
         Student(int pStNo, char *pName);
         float calcAvg();
         void print();
};
```

f) Consider the following classes.

```
class Rectangle
{
 private :
   double length;
   double width;

 public :

   Rectangle( double pLength,
              double pWidth);
   double area();

};
```
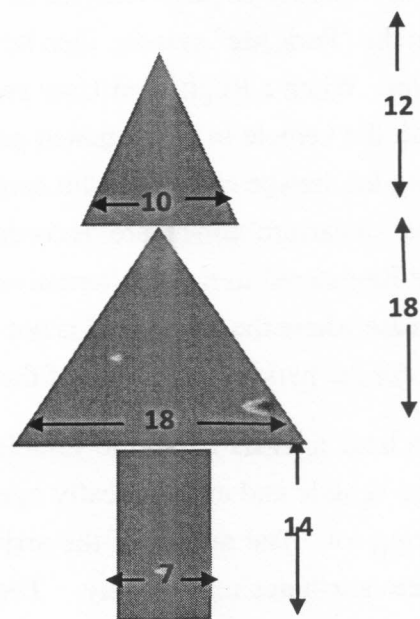
```
class Triangle
{
 private :
   double height;
   double base;

 public :

   Triangle(double pHeight,
             double pBase);
   double area();
};
```

Write a client program to find the area of the shape shown below using the methods given in the above classes. (8 marks)

g) Draw separate UML class diagrams to link the following classes using association, aggregation, composition, inheritance and multiplicity where appropriate. (8 marks)

   i) Report, Chapter Header, Chapter Footer, Chapter, Pages
   ii) Insurance, Insurance Agent, Customer, Life Insurance, Health Insurance
   iii) Undergraduate Student, Postgraduate Student, Student, Subject, Lectures, Exam
   iv) Invoice, Customer, Item, Supplier

Question 02 (20 marks)

Draw at least 5 CRC cards for the scenario of a Parking Management System given below by identifying the possible classes, their responsibilities and collaborations.

"Park Me" is a private parking facility provided in Colombo-03 for vehicle owners and drivers. The users can get the facility to park vehicles in "Park Me" in several ways. If the user is a Registered User in the "Park Me" system, then he/she can use the swipe card issued for him to enter the parking lot. When a Registered User swipes the card at the entrance, the gate opens and he/she can park the vehicle in a designated parking space. When a Registered user wants to leave the parking lot, he/she can swipe the card again and exit the parking lot. The details of the arrival and departure times are recorded in the arrival and departure attributes respectively. The Registered user can alternatively provide the National Identity Card to the gate keeper in the case where the swipe card is not with him/her. The registered users will have to do the payment for the parking at the end of the month.

An RFID User can have a RFID tag in the vehicle to enter the parking lot. The system reads the RFID tag in the vehicle and automatically opens the gate. Similar activity happens when he leaves the parking lot. The details of the arrival and departure times are recorded in the arrival and departure attributes respectively. The RFID users have to pay a fixed amount at the time they register with the system and the payment for each time they use the parking lot, will be automatically deducted by the system. When the initial payment comes to a minimum of Rs. 100/= the users can reload the money with a fixed amount by paying to the gate keeper at the entrance.

A temporary user can directly proceed to the gate and informs the gate keeper and obtain a temporary parking card from the gate keeper to enter the parking lot and produce the card to exit the parking lot. At the exit the gatekeeper will inform the payment to the temporary user according to the entrance and exit times and produce a receipt when the payment is done.

The gate keeper at the parking lot logs to the system at the beginning of the shift. At the end of the week the manager generates a report summarizing the utilization of the parking lot. Every month the manager generates a report on the profitability of the parking lot.

Question 03   **(25 marks)**

Read the following description and identify the classes, attributes, methods and relationships between classes, and multiplicity specifications. Draw a UML class diagram for the following scenario using the above features.

A Ward is a division of a hospital where beds are offered to patients who need care. In a hospital, there are a number of wards, each of which may be empty or have one or more patients. Each ward has a unique no and a name. Wards are also differentiated by gender of its patients. i.e. male wards and female wards. Every ward has a fixed capacity, which is the maximum number of patients that can be in it at one time. (i.e. the capacity is the number of beds in the ward). Different wards may have different capacities.
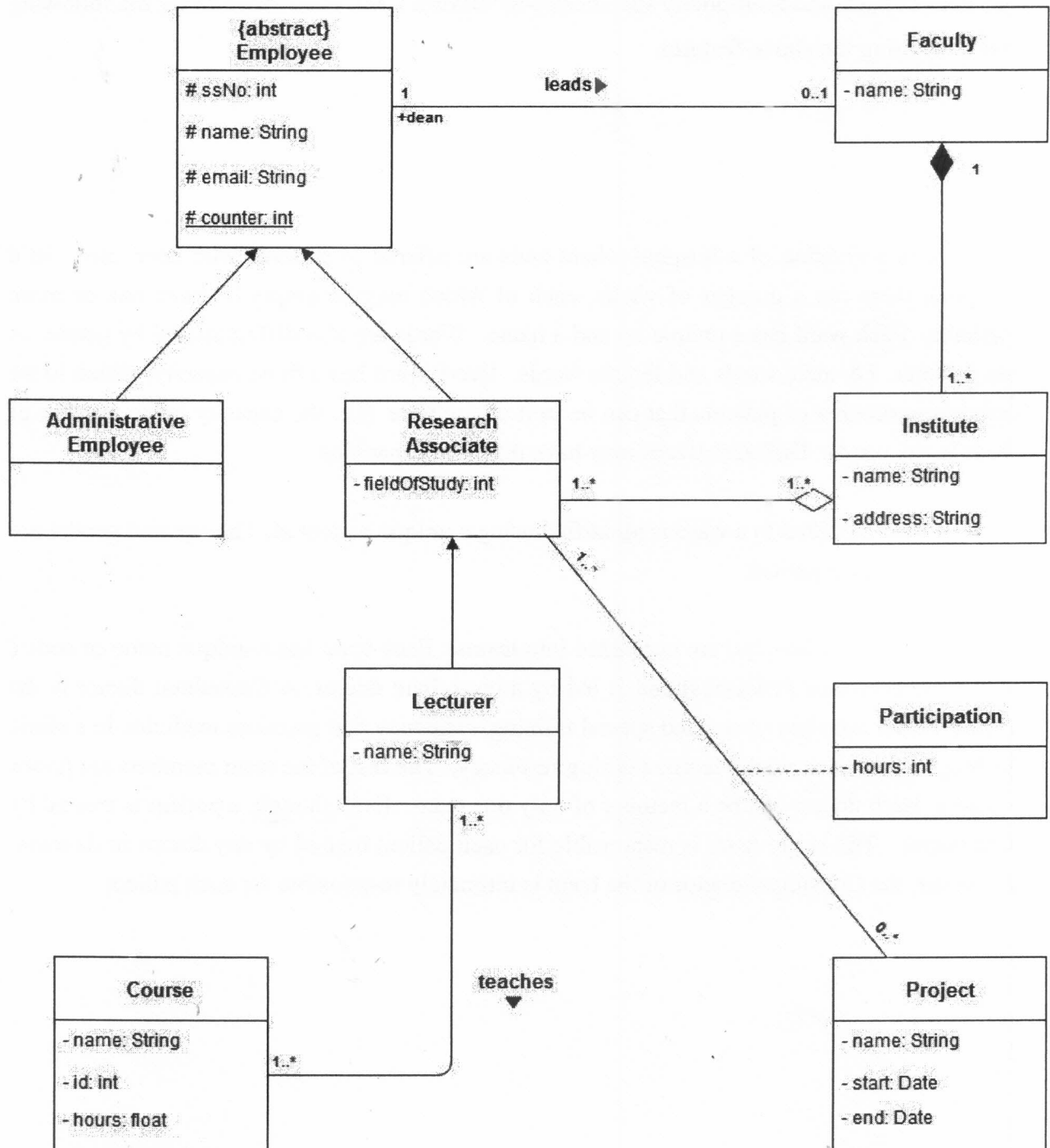
Each patient admitted to a ward is identified using a unique patient id. The age and gender are recorded for each patient.

The doctors in the hospital are organized into teams. Each team has a unique name or code (e.g. Orthopedics or Pediatrics) and is led by a consultant doctor. A Consultant doctor is the senior doctor who has completed special training, residency and practices medicine in a clinic or hospital, in the specialty learned during residency. The rest of the team members are junior doctors. Each doctor can be a member of only one team. Even though, a patient is treated by one doctor. The entire team is responsible for each patient treated by any doctor in its team. However, the Consultant doctor of the team is ultimately responsible for each patient.

Question 04　　　　　　　　　　　　　　　　　　　　　（ 20 marks ）

Consider the following class diagram and write the coding for the classes shown in the diagram considering the relationships among them. You are not required to write any methods for the classes.