University of Ruhuna - Faculty of Technology
BACHELOR OF ENGINEERING TECHNOLOGY
Level 2 (Semester 1) Examination, October 2018

COURSE UNIT: ENT2142, OBJECT ORIENTED PROGRAMMING
Time Allowed: 2 hours
Answer all **four (04)** questions

Question 01

a) Briefly explain the concepts **Class** and **Object** in the object-oriented programming language (OOP).

b) Explain **Data Encapsulation** in OOP using an example.

c) Write the definition for a class called **Rectangle** that has floating point data members named length and width. The class has the following member functions:
void setlength(float) to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **int sameArea(Rectangle)** that has one parameter of type Rectangle. The **sameArea** function returns 1 if the two Rectangles have the same area and return 0 if the area is not same.

    i.   Write the definitions for each of the above member functions.

    ii.   Write main function to create two rectangle objects with following characteristics.

- Set the length and width of the first rectangle to 5 and 2.5 respectively.
- Set the length and width of the second rectangle to 5 and 18.9.
- Display each rectangle's area and perimeter.

    iii.   (a). Check the similarity of the areas of two rectangles mentioned in question (b) Print the message "Rectangles have same area" if they are same or else "Rectangles have not same area".

Question 02

a) Write two **types of constructors** with example for each.

b) Briefly explain the difference between the **constructor** and **method** of a class.

c) "Nishan Tours and Rent a Car" is a vehicle renting company which rents out cars and vans to its customers. The rental fee is calculated as follows for a vehicle

- For a car: -

Rental fee = fixed value for a car + charged value for first 5km + value for additional distance per km

- For a van: -

Rental fee = (Number of Days * Fee per day) + fixed value for a van

- Fixed value for a car: Rs. 2500
- Charged value for first 5km: Rs 500
- Value for additional distance per km: Rs. 100

- Fixed value for a van: Rs.3000
- Fee per day: Rs. 2500

Write a C++ program using the object-oriented concepts to calculate the rental fee for the vehicles listed in table 1, rent out by three customers.

Note: You should use base classes, constructors and functions to develop the program.

Item Number	Number of the Vehicle	Vehicle Type	No of days/Distance (km)
10200	3527	Car	8
10201	1234	Car	5
10202	1545	Van	14

Table 1

Question 03

a) State the difference between **Multiple inheritance** and **Multilevel inheritance.**

b) Compare the **Sub class** and **Super class** using an example.

c) **"AgroHarpan Factory"** is a company which has two types of employees namely Executive and Labor. All employees have employee number, basic salary, allowances, deductions, net salary and employee type (executive or labor). All employees are subjected to promotion and demotion. Further, executive employees are paid salary while labor employees are paid wages.

- Executive employees have a monthly salary. When executive employees get promotions, their basic salary will be increased by 20%. Further their allowances will be increased by 10%. When they get demotion, the salary will be decreased by 15%.

- Labor employees have an *hourly rate* and *number of hours* worked. Their salary is calculated as ***number of hours*hourly rate.*** When labor employees get promotion, their hourly rate will be increased by 15% while for demotion hourly rate will be decreased by 5%.

Write a C++ program to perform the following tasks relates with the description given below.

- User is able to enter relevant details,
- Display net salary before promotion or demotion of an employee
- Display the salary after promotion and demotion.

Note: constructors to initialize data members. You should use base classes, derived classes, constructors, destructors, functions and inheritance to develop the program.

Question 04

a) Briefly explain the term "**Polymorphism**".

b) State the difference between '**Overloading**' and '**Overriding**'.

c) "Horizon Club" is a sports club and it has two types of memberships Gold and Platinum. Members of the club need to pay the relevant membership fee at end of each month. Membership fee is calculated as follows.

- For Gold Members: -
  Monthly Payment = Rate per hour*No of hours + Rs.100

- For Platinum Member: -

- Monthly Payment = Rate per hour*No of hours

Write C++ program using the concept of **pure virtual functions and abstract base classes** to calculate the membership fee for 4 members given in Table 2.

Name of the Member	Membership Type	No of Hours	Rate per hour
Shahid	Gold	10	Rs.200
Saman	Platinum	5	Rs.300
Shehan	Platinum	12	Rs.200
Malith	Gold	7	Rs.300

Table 2