SECTION A

a) Find the error(s) in each of the following and explain how to correct it (them):

i)
```
int a, b;
int sum = a + b;
cout << "Enter two numbers to add: ";
cin >> a;
cin >> b;
cout << "The sum is: " << sum;
```

ii)
```
string 9x
cin << 9x;
if (9x = 5) {
cout >> 9x;
```

b) Using a suitable example, explain the concept of polymorphism.

c) Design a UML model of the following object and provide at least five requests that can be made to an instance of the object:

i) Vehicle
ii) Mammal

d) Using an example, differentiate between Constructors and Destructors.

e) Indicate whether the following statements are true (T) or false (F):

i) Comments are used throughout a program to improve its readability.
ii) Classes are essentially reusable software components.
iii) Encapsulation only encapsulates data members but doesn’t bind them to the functions that manipulate the data.
iv) A derived class cannot have many base classes.

SECTION B

Question One

Using the concept of inheritance, write a program to compute:

a) The area of a circle with radius.

$$A = \pi r^2$$

b) The area of a sector of a circle.

$$A = 1/2 \times r^2\theta$$

c) The circumference of a circle.

$$C = 2\pi r$$

Question Two

a) In machine learning, datasets are usually run through different classification models to predict patterns. Write an interactive OOP based C++ program to calculate the following using observed and predicted values.

$R^2 = 1- ((observed - predicted)^2 / (observed + predicted)^2)$

b) Write an interactive OOP based C++ program to find the equivalent resistance of three resistors in parallel with 2 resistors in series.

Question Three

a) Write an interactive OOP based C++ program to compute the speed of sound (a) in air of a given temperature T(degree Fahrenheit) using the relation:

a = 1086(((5T+2297)/2457)^.5)

b) Write an interactive OOP based C++ program to compute the relativistic gamma.

Relativistic Gamma = 1/(1-(v/c)^2)^.5. Where c= 2.99792458 x 10^8 cm/s^2

Question Four

a) Write an interactive OOP based C++ program to take a depth (n kilometers) inside the earth as input data and compute the temperature at this depth in degree Celsius and degree Fahrenheit using the relations:

Celsius = 10(depth)+ 20

Fahrenheit = 1.8(Celcius) +32

b) Write an interactive OOP based C++ program to compute the distance of the center of gravity from a reference plane in a hollow cylinder sector:

$$\text{Center} = \frac{38.1972(r^3 - s^3)\sin a}{(r^2 - s^2) \cdot a}.$$

Question Five

a) Using the concept of Inheritance, write an interactive OOP C++ program to estimate the index of refraction of a piece of glass.
Ind_Ref= Sin(Inc_angle_vacuum)/ Sin(Inc_angle_glass)

b) Write an interactive OOP based C++ program to find the factorial of a number using a constructor and a destructor.