CSC238 – Object Oriented Programming
Academic Session Sep 2019 – Jan 2020
Lab Assignment 5 - Polymorphism

Course Outcomes (CO)	LO1	LO2	LO3
CO1			
CO2	√	√	√
CO3			

5.1 Given the following `Sphere` and `Cylinder` subclasses are inherited from `ThreeDShape` superclass.

Superclass : `ThreeDShape`

Attributes:
```
String color;          //red, blue and yellow
```

Methods:
```
//Constructor, mutators, retrievers, printer, and processor

abstract double calcVol(); //to return the volume of shape
```

Subclass : `Sphere`
Attributes:
```
double radius;
```

Methods:
```
//Constructor, mutators, retrievers, printer, and processor
```

Subclass : `Cylinder`
Attributes:
```
double radius;
double height;
```

Methods:
```
//Constructor, mutators, retrievers, printer, and processor
```

Answer the following questions by using polymorphism concept:

a) Write the following method for each class:
- Default/Normal Constructor
- Mutator/Setter
- Accessor/Getter
- Processor
- Printer

b) Write abstract methods of `calcVol()` to calculate the volume of sphere and cylinder. The formula are shown as below:

volume of sphere = $\frac{4}{3}\ \pi r^3$

volume of cylinder = $\pi r^2 h$

where r is radius and h is height.

c) Write a Java application to perform the following tasks:

i. Write a program to store 100 objects regardless of the `Sphere` or `Cylinder` types.

ii. Display the details of object information for all objects

iii. Count and display the number of object sphere and cylinder.

iv. Calculate and display the average of volume of blue and red Cylinder object only.

5.2 By referring to the **Final Examination Paper (Dec 2018), PART B, QUESTION 6**. Write a complete Java program.

5.3 By referring to the **Final Examination Paper (Jun 2018), PART B, QUESTION 8**. Write a complete Java program.

5.4 By referring to the **Final Examination Paper (Jan 2018), PART B, QUESTION 6**. Write a complete Java program.