

**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**ROORKEE – 247 667**

(Autumn Semester 2016 – 17)

**Fundamentals of Object Oriented Programming (CSN 103)**

**Assignment 8**

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- (1) Which part of the memory is involved in Garbage Collection?
- (2) How can we request JVM to start garbage collection process?
- (3) What are the responsibilities of Garbage Collector?
- (4) What are the different ways to make an object eligible for garbage collection when it is no longer needed?
- (5) How many times does the garbage collector calls the `finalize()` method for an object?
- (6) Consider an example of declaring the examination result. Design three classes: Student, Exam and Result. The student class has data members such as those representing roll number, name, etc. Create the class Exam by inheriting Student class. The Exam class adds fields representing the marks scored in six subjects. Derive the result from the Exam class, and it has its own fields such as `total_marks`. Write an interactive program to model this relationship.
- (7) Create a super class shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called `triangle` and `rectangle` from the super class shape. Add to the super class, a method `get_data()` to initialize super class data members and another method `display_area()` to compute and display the area of figures. Make `display_area()` as an abstract method and redefine this method in the derived classes to suit their requirements.

Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively, and display the area. Remember the two values given as input will be treated as lengths of two sides in case of rectangles, and as base and height in the case of triangles, and used as follows:

Area of rectangle =  $x * y$

Area of triangle =  $0.5 * x * y$

(8) What is the difference between `super()` and `this()`?

(9) In a case where there are no instance variables what does the default constructor initialize?

(10) State the difference between `static` and `final` keyword.

(11) Why abstract class not made as `final` ?

(12) Assume that there are two different companies: one develops a `student` package and the other develops a `staff` package containing relevant classes. Implement a simple university system that makes use of classes/capabilities provided by these packages.

(13) IIT Roorkee awards some grace marks to students who participate in the Inter IIT games. Therefore,  $\text{total marks awarded} = \text{Exam\_Marks} + \text{Sports\_Grace\_Marks}$ . If total marks scored are greater than maximum marks, then the final marks awarded will be equal to the maximum marks. An Object Oriented based implementation will contain a class called `Results`, which extends a class called `Exam`, which itself extends a class called `Student`. It will also contain an interface called `Sports`, which is implemented by the `Results` class. The `Results` class will be responsible for computing the final marks scored by the students. Write a Java program along with an interactive driver class.