

**DEPARTMENT OF COMPUTER SOFTWARE ENGINEERING
MILITARY COLLEGE OF SIGNALS, NUST**

[CS-212] Object Oriented Programming

BESE-25 A

Exam: Final
Type of Paper: Regular
Semester: Spring 2020

Instructor: Maj Khawir Mahmood
Total Marks: 50
Time Allowed: 120 mins

Note:

1. This question paper has **THREE** pages and **FOUR** questions.
2. Attempt all questions.
3. Understanding of questions and intelligent time distribution is part of the examination.
4. This is **OPEN** book and **OPEN** notes paper.
5. Questions are complex enough to have unique solutions. Copying/ plagiarism will be awarded **Zero**.
6. Write solution on A4 sheets, take photo of answer sheets, make pdf/word document & upload on MS teams. Write name, registration number, course, section, subject, semester and page number on each page of the answer sheet.

Question No. 1:	CLO	Marks
	01	10

Keeping in view the hot summers in your region vis-à-vis inflating electricity costs, the marketing department of a smart home appliance company has conceptualized a battery powered smart fan with features mentioned below. Your company has been consulted to write a Java class **Smart_Fan** that contains all variables, constructors and methods to implement the functionality. You being a motivated developer have volunteered for the task and promised to come up with a good solution that encompasses best practices of object oriented programming.

- a. Unique fan ID and a counter auto-incrementing for all objects
- b. On/ off and stop/ rotate feature
- c. Speed ranging from 1 to 10
- d. WiFi connectivity status
- e. Battery status/ level with calculation of time left till next charge and life remaining/ health
- f. Timer feature for auto power off and on
- g. Run time monitoring (total, current, daily, monthly) in minutes
- h. Display function to show above mentioned features

Question No. 2:	CLO	Marks
	02	15

On a free day, you are enjoying snacks at a nearby coffee shop. The weather is pleasant and there you meet a person who has come for the same. During conversation, you find out that he works in a warehouse that orders tyres in bulk and stacks them on one-another until a client buys one. But the labour stacks the tyres wrongly thereby causing unnecessary damage to the tyres. You being a good engineer, promise him to solve the issue and ask for further details. He provides you the following information:-

- a. Each tyre has a diameter from 15 to 19 inches
- b. Manufacturing year of tyres is from 2016 to 2020
- c. A big tyre cannot be stacked on top of a small tyre

- d. An old tyre cannot be stacked on top of a new tyre
- e. Only one tyre can be stacked or unstacked at a time
- f. Labour fee for stacking and unstacking the tyre depends upon tyre size i.e. 10 cents per inch of diameter

After finding the details, you plan to solve it as follows: -

- a. Implement a Java **Tyre** class with required data members, constructors & functions
- b. Implement a Java **Tyre_Stack** class with required data members, constructors & functions
- c. Implement a Java **Labour_Cost** class that takes an array of unsorted *tyres*, places *tyres* on *tyre_stacks* and keeps track of each stack & unstack activity to compute the labour_cost

Question No. 3:	CLO	Marks
	03	10

Congratulations on successful completion of the Object Oriented Programming course. Your performance in the course was remarkable and in summer vacations you got internship in a software house. On one fine morning, your team lead introduces you to a client who needs a simple Java class implemented. The class should contain methods to tell whether a given integer is even or odd but without use of modulus(remainder) operator. Your team lead has asked you to come up with a unique class name and three different implementations for approval by the client.

Question No. 4:	CLO	Marks
	03	15

- a. Rewrite the Java classes given below so that they are derived from a base class named **Home**. You are to write the code for the new Home class as well. Your task is to avoid repeating code as much as possible. Write the classes by applying concepts of abstraction, inheritance, polymorphism etc. that you have learned in the course. Implement the main program and make objects of the re-written classes demonstrate the concepts you have applied.

```
public class House
{
    public House(int sz, String addr, int t)
    {
        this.size = sz;
        this.address = addr;
        this.taxes = t;
    }

    public final int getTaxes()
    {
        return taxes;
    }

    public final double estimateUtilities()
    {
        return size * size / Math.exp(size / 3);
    }

    public final String getAddress()
    {
        return address;
    }

    private int size;
    private int taxes;
```

```
    private String address;
}

public class Apartment
{
    public Apartment(int sz, String addr)
    {
        this.size = sz;
        this.address = addr;
    }

    public final double estimateUtilities()
    {
        return size * size / Math.exp(size / 3) - size / 10;
    }

    public final String getAddress()
    {
        return address;
    }

    private int size;
    private String address;
}
```

GOOD LUCK