National University of Computer & Emerging Sciences, Karachi
Spring-2023 School of Computing (BSCS, BSCS-R, BSSE, BSCY, BSAI)
Midterm 1
27th Feb 2023, 10:00 am – 11:00 am

Course Code: CS1004	Course Name: Object Oriented Programming
Instructors Name: Dr. Farooque Hassan Kumbhar, Dr. Abdul Aziz, Mr. Zain-ul-Hassan, Ms. Abeer Gauher, Mr. Basit Ali, Ms. Sobia Iftikhar, Ms. Aqsa Zahid, Ms. Sumaiyah, Ms. Abeeha Sattar, Ms Javeria Farooq, Mr. Shahroz Bakht, Ms. Eman Shahid	
Student Roll No:	Section No:

Instructions:

- Return the question paper and make sure to keep it inside your answer sheet.
- Read questions completely before answering. There are **3 questions, 2 sides on 1 page**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- You are **not allowed to write** anything on the question paper (except your ID and section).

Time: 60 minutes.   **Max Marks**: 30 Marks

Q 1.   Write two-line short answers to the following questions: **[10 min, 6 Marks]**

    a.   If we add a parameterized constructor, then there is no need for a setter function. Do you agree with this? Explain.

    b.   How can you prevent copying of objects?

    c.   Why is "this" operator used? Is it possible to use "this" operator outside of a class? Justify.

    d.   Can static functions access non-static data? Justify your claim.

    e.   What are the cases in which the copy constructor of a class gets called?

    f.   Why is a constructor automatically called when an object is created in OOP?
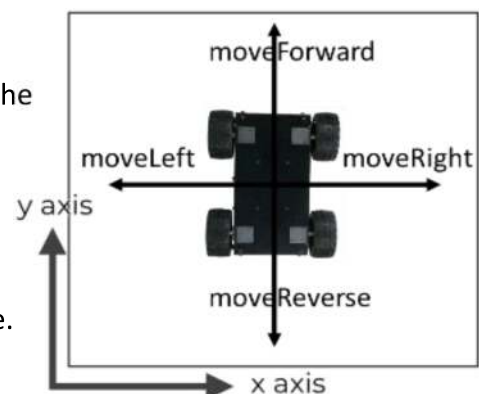
Q 2.   In the world of AI, let's make a robot that cleans the house by taking x, y position. A robot has information of its current position as an x-axis point (left and right) and y-axis point (forward and reverse). The Robot can move Left, Right, Forward and Backwards. For this purpose, the robot has the following methods: **[25 min, 6+6 Marks]**

moveLeft that moves the robot from the current position to the left for '**d**' distance.
moveRight that moves the robot from the current position to the right for '**d**' distance.
moveForward that moves the robot forward for '**d**' distance.
moveReverse that moves the robot backwards for '**d**' distance.

    a.   Write a program that includes Robot class with appropriate variables and functions. Do include default and parameterized constructors with default values. Must include a copy constructor that can be used to copy values of an object and assigned to another. Just for the fun of it, copy constructor creates an opposite image of existing object, i.e. assignment of x to y and y to x. Depending on the variable type and code requirements, define accessor/ mutator functions.

    b.   Write a member function void commands (string act, int d) that moves the robot by reading each character from the string. For example, act = "RRLF" then there are four

actions, and the actions will move robot in right direction with d points, then right direction with d points, then left direction with d points, then forward direction with d points. Following is the character-wise action: [L for moveLeft, R for moveRight, F for moveForward, B for moveReverse].

Q 3. "Netflix2" animation studio produces animated movies and aims to properly manage their "movie projects" and "staff". The studio works on many different movies projects and staff assigned to them. Write a program to perform the given tasks: **[25 min, 5+5+2 Marks]**

    a. To maintain information of a movie project. The movie information includes movie id, title, the total budget, and current cost of the movie. Moreover, each movie has two staff members, a project lead and chief animator. Apart from this, the movie project also has the following behavior: **void Production (),** This behavior allows project lead and chief animator to perform their assigned job and print that the task is in production. The class should have a global member that keeps track of total budget of all the movies created.

    b. Each staff information includes staffID, salary, employee type. Employee type can have only two possible values of project lead or chief animator. The class should have a global member that keeps track of total salaries of all the staff employed. Apart from this, an employee demonstrates the behavior **double TrackProject (double currentCost)** if the type of that employee is project lead. And **double Animate (double currentCost)** if the type of that employee is chief animator.

        i. Each time the chief animator animates, it adds PKR 10,000 to the current cost of the movie.

        ii. When a project lead tracks a project, he checks if the current cost of the movie is exceeding PKR 200,000. If it is exceeding budget, then he immediately shows a "warning: that cost is exceeding budget".

    c. Draw a UML / Class diagram that represents the above given system to highlight OOP features.

BEST OF LUCK!