FAST- National University of Computer & Emerging Sciences, Karachi.
School of Computing,
Mid Examination, Spring 2022
7th April, 2022, 8:15 AM – 9:45 AM

Course Code: CL-1004	**Course Name:** Object Oriented Programming Lab
Instructors: Muhammad Sudais	**Paper:** B
Student Roll No: 21K-3158	**Section:** BCS-2J

Instructions:

- Except your Roll No and Section, DO NOT WRITE anything on this paper.
- Return the question paper and Submit your codes in a single txt file on Google Classroom before the end of time.
- Read each question completely before answering it. There are **4 questions on 2 pages.**
- In case of any ambiguity, you may make assumptions but your assumption must not contradict any statement in the question paper.
- Time distribution: Total time is 90 minutes. 15 minutes are allotted for reading the question paper and submission on google classroom. 75 minutes are allotted for solving the problems.

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Time Allowed: 90 minutes 13 **Maximum Points**: 100

Question 01- Warm Up *(Estimated Time: 10 minutes, Total Marks: 20)*

Create a single C++ Program which has two functions. The first function returns true if the string is palindrome. If the string is not palindrome, the 2nd function will take the string and make it palindrome by changing ONLY the unmatched characters (ABBAA -> AABAA or ABBBA). Using the appropriate arguments and return type for functions is part of question.

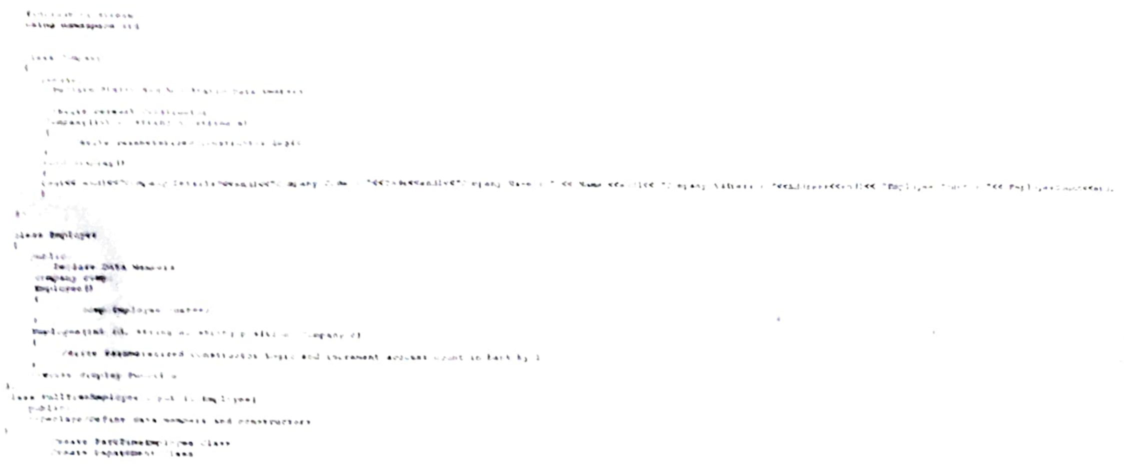
Question 02- Case Study *(Estimated Time: 25 minutes, Total Marks: 30)* 24

You have to create an Employee management system for a company.

A company must have a code, a name and an Address. It must have the functionality of displaying its details. An employee is associated with company so it must have a company object, name, employee id and a position. Whenever an employee is created/constructed (with or without parameters), the employee count in company object must increase by 1. It must have a functionality to display its details. Furthermore, an employee can be of two types a fulltime or a parttime employee. A fulltime employee has a salary which by default is 20000 but can be set to any value when the employee is created/constructed. A part time employee has a salary per hour which is 500 by default and work hours per week which is 20 by default but both of them can also be set while creation. A department has a name, a revenue, an id, and a head of department which is basically employee. It must have a functionality to display its details.

```
int main()
    {
        Company c(111,"AYZ Corp","ABC Street");
        c.display();
        Employee e1(12234,"Employee 1","HOD",c);
        Employee e2(12233,"Employee 2","HOD",c);
        c.display();
        e1.display();
        e2.display();
        Department d1(e1,"Dept1",1,100000);
        Department d2(e2,"Dept2",2,200000);
        d1.display();
        d2.display();
        FullTimeEmployee f(20000);
        PartTimeEmployee p(20,1000);
    }
```

A basic scratch of the mentioned code is given. The driver program is also given.



```
[illegible]
using namespace std;

class Company
{
  [illegible]
    [illegible]

    [illegible]
    Company([illegible])
    {
        [illegible]
    }
    void display()
    {
    [illegible]
    }
};

class Employee
{
  public:
    Declare DATA Members
    Company comp;
    Employee()
    {
        comp.Employee [illegible]
    }
    Employee(int id, string [illegible] Company c)
    {
        //Write Parameterized constructor logic and increment account [illegible]
    }
    //Write display function
};
class FullTimeEmployee : public Employee{
  public:
  //Declare/Define data members and constructors
}
        //Create PartTimeEmployee class
        //Create Department class
```

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Question 03- Word Cloud *(Estimated Time: 25 minutes, Total Marks: 30)*

✓ Ship	SetTicketPrice	CapacityPerBogie
IncreaseMaxSpeed	ArrivalTime	DepartureTime
NoOfBogie	RailRoad	Driver
✓ Vehicle	IncreaseCapacity	ShipName
SetArrivalTime	IncreaseBogie	Sailor
SeaRoute	✓ Train	ShipNumber
ChangeSeaRoute	MaxSpeed	TrainName
Drive	Sail	SetDepartureTime
Capacity	TicketPrice	ChangeRailRoad

In the table above, you have all the necessary classes, attributes and functions required to implement an Object Oriented Case. You have to find out the right classes (that are only 3). There are 2 types of vehicles in the given case. Vehicle has some members that its child classes also possess but each child class has its own additional set of attributes and functions which are also given in the above word cloud. You have to find out the correct classes first and then to identify the attributes and functions for each class.

You must create a default and a parameterized constructor for each class. Each class should also have a display function which prints the details of that class. The driver function must call show all the implementations done in classes.

Question 04- UML to Code *(Estimated Time: 15 minutes, Total Marks: 20)*

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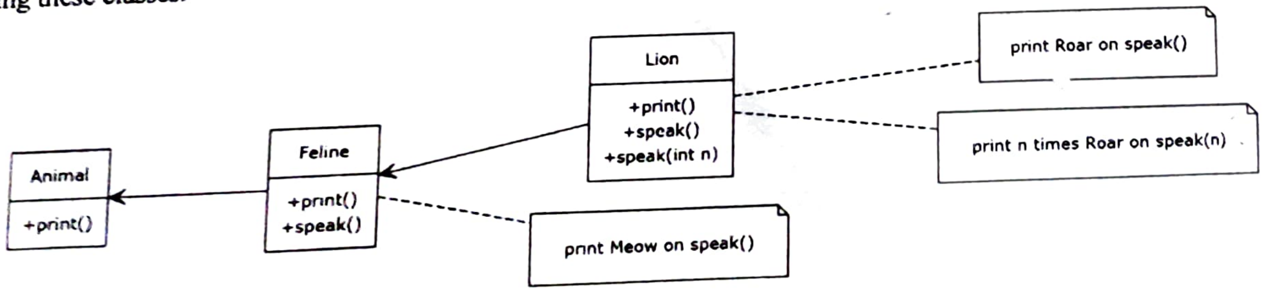
Convert the given UML class diagram to code. Each function should print the class name first and then the required details. You can add more members if you feel necessary. Each print function should print the class name. Write a proper driver program for utilizing these classes.



Best of Luck ☺