National University of Computer & Emerging Sciences, Karachi

Spring-2021 (School of Computing)

Midterm-I

Course Code: CS-217	**Course Name:** Object-oriented Programming
Instructor: Dr. Abdul Aziz / Basit Ali / Behraj Khan / Syed Zain Ul Hassan / Talha Khan / Nida Munawar	
Student ID:	**Section:**
Date: Mar 15, 2021	**Time:** 11 a.m. - 12 p.m. (60 Minutes)

Instructions:

- Attempt all tasks.
- The paper contain **3** questions on **2** pages.
- Return the paper after the exam.

Max Points: 40

Question 1. Identify the errors with appropriate reasons if any and provide the error free code.

(5 points each)

(Expected time to attempt 05-10 minutes)

a)

```
#include<iostream>
using namespace std;

class A
{
      int *x;
      public:
      A()
      {
            x = new int;
      }
      memory_allocate()
      {
            x = new int;
      }
      memory_free()
      {
            delete x;
      }
      ~A()
      {
      delete x;
      }
};
int main()
{
      A a;
      a.memory_free();
}
```

b)

```
#include<iostream>
using namespace std;
class ABC
{
      int x;
      static int y;

      public:
      ABC()
      {
            x = 0;
            y = 0;
      }

      ABC(int a, int b)
      {
            x = a;
            y = b;
      }
};

int main()
{
      ABC a;
      ABC b(1,2);
}
```

Question 2. Short answer questions (answer in a sentence or two):

(3 points each)
(Expected time to attempt 05-10 minutes)

a) When the user-defined copy constructor is required?
b) Is it necessary to have a setter function if we have already defined a parameterize constructor?
c) How can we initialize the constant data members present inside a class? You should add a code snippet to support your answer.
d) Constructor is a function and still does not return a value, why?

Question 3. You are tasked with developing an application for a microfinance bank which offers loan to customers on easy installments and low interest rate.

(2 Points each)
(Expected time to attempt 30-35 minutes)

In order to issue loans, your application must keep track of customer details including their first name, last name, NIC#, permanent address, current city, annual income and also whether the customer is a tax filer or not. Every customer is going to have a different NIC#, but the NIC# will remain the same for each individual customer.

The bank has several branches across the country and each of these branches are identified by their city, & also contain a branch code and are managed by a branch supervisor. Furthermore, different branch can offer loans to their customers at different interest rates, however, only one interest rate is used by each branch. The interest rate can either be 1.5%, 2.0% or 3.5%.

Perform the following tasks:

- **a)** Identify all the entities in the given scenario.
- **b)** Create a class diagram / object interaction diagram.
- **c)** Create any one class and define attributes and related functions.
- **d)** Add a constructor in the class created in part c and initialize their relevant attribute.
- **e)** Write relevant C++ statements to declare three branches of the microfinance bank.
- **f)** Write a member function named ***IssueLoan*** that takes customer details and requested loan amount as inputs and confirms loan issuance (via string message) if the loan amount does not exceed the annual income of the said customer and the customer resides in the same city where the branch is located.
- **g)** Write a function named ***LoanCalculator*** that takes a requested loan amount as input and displays the total payable amount (including interest)
- **h)** Implement the following behavior in your identified class.

```
Main()
{
        Class obj1.
        Class obj2(obj1)
}
```

- **i)** Provide a mechanism to track the overall loan (total loan amount) issued to all customers combined.

Happy Coding*