National University of Computer & Emerging Sciences, Karachi
Fall-2021 CS-Department
Lab - Final Examination

29th December 2021, 11:30 am – 01:30 pm

Course Code: CL 1004	Course Name: Object-oriented Programming Lab
Instructor Name: Names: Nida Munawar / Abeeha Sattar	
Student Roll No:	Section No:

Instructions:

- Attempt all questions, read each question completely and use your question paper for rough work.
- After completion of exam, return the question paper.
- Your Student ID and Section No must be written on the paper.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- For Exam submission: Create a folder named "your student-id" i.e. (K20-0100).
- Paste the .cpp file and screenshot of output for each question and named question and screenshots as Q1- your student-id.cpp and on so in that folder.
- Do not submit rar files
- Submissions should be made in the folder on Google Classroom.

Time: 110 minutes. **Max Marks:** 50 points

Question 1:

SmartFiber internet services provide internet service to the users in many different cities. One of the keys aspects of their service is their flexible packages for different usage types.Their head office is located in Karachi but they have offices in countless cities across the country. The packages they provide to the user is based on their demand. The user can generally request for a package by sending his details like full name, city, address and telephone number. The different types of packages the company offers are DailyMega, DailyExtreme and DailyOffPeak.

The DailyMega package provides speed up to 25Mbps for Rs. 6000/month, the DailyExtreme package provides 20Mbps for Rs. 5000/month while DailyOffPeak package gives 10Mbps for Rs. 3500/month. All of these packages give unlimited volume.

1. Create three small standalone classes
   DailyMega,
   DailyExtreme and
   DailyOffPeak

2. Identify the type(s) of inheritance present in the model, Give each class some unique appropriate attributes and behaviors that it does not have in common with other classes

3. Provide suitable implementation for default and parameterized constructor(s) of each class.

4. Write an abstract class, SmartFiber with only a pure virtual getOffer method. Have each of your classes inherit from that abstract class and implement the getOffer method

5. To calculate getOffer you have to take input from user about internet usage level
   What is your internet usage level?
   1. Greater than 10 GB
   2. Less than 10 GB

Users, who use more than 10GB per month, a chance to upgrade their package at 10% discount for first three months.

6. Write a program that creates objects of each of the three classes, polymorphically invoking (runtime) each object's getOffer method.

7. Write the results to the file SmartFiber.dat, so that you may use the results later.

Question 2:

Create a template class **SumArray** that contains function **sum** to find sum of array of N(array length is given by user) items in an array. The type of array needs to be generic (int, float and double only) while the array size can be different for each object.

Question 3:

Suppose that you are working on an encryption program. Your encryption program has a class named **Encryption**, which has two attributes:

- textToEncrypt (string)

Create constructors, accessor and mutator methods as necessary.

The class **Encryption** will have two methods:

- **string encrypt () {// your encryption logic}**
- **string encrypt (string t) {// your encryption logic}**

The working of your **string encrypt ()** method is as follows:

- Capitalizes every alternate character in the string textToEncrypt that isn't capitalized.
- Shifts every character to the next character.
- For example, the string "stringtesting" would become: "TuSjOhUfTuJoH"

The working of your **string encrypt (string t)** method is as follows:

- Concatenates the strings textToEncrypt and t
- Calls the **encrypt ()** method.
- Returns the encrypted string.

Your program should throw an exception when it finds the character 'a' or 'A' string. The exception should throw a character 'A' and it should be caught in the catch block.

Also create a custom exception called **invalidCharacter**. Your function should throw this exception if the input string has any other characters that are not part of the English alphabet (A-Z and a-z, anything else should be considered invalid, and you should throw the exception when you encounter it) **Note:** ASCII codes for a-z (97-122), A-Z (65-90) **In case of any exceptions your program should return the following statement: "Some error occurred"**

Some examples:

Input:	**Output:**	
string	TuSjOh	
stringname	Caught an exception: A Some error occurred	
string!!	Caught an exception: String contains invalid characters Some error occurred	
textToEncrypt = string t = st	TuSjOhTu	//for method encrypt(string t)