



National University of Computer & Emerging Sciences, Karachi
Fall-2023
School of Computing
Lab Midterm



16th October 2023, 01:30 pm – 03:30 pm

Course Code: CL1002	Course Name: Programming Fundamentals
Instructor Name: Mr. Shafique Rehman	
Student Roll No:	Section:

General Instructions: Carefully read the following instructions before attempting the paper.

- Except your Roll No and Section, DO NOT WRITE anything on this paper.
- The Mid Exam consists of 3 questions on 2 printed sides of 1 page.
- In case of any ambiguity, you may make assumptions, but your assumption must not contradict any statement in the question paper.
- DON'T share your program, if your code is matched to any member of your class, both will get straight F in the course without asking who shared or who magically copied.

Submission Instructions:

- You must comment your student ID on top of each file. (Line#1 of your code).
- Name the .c file for each question according to Roll_No e.g. k23-xxxx_Q1.c, k23-xxxx_Q2.c etc.
- Create a ZIP folder of all your solutions and copy it in the local storage with the title K23-xxxx_A.
- Submissions are on local storage that can be accessed using win+run keys and entering \\172.16.5.43 address in the dialog box.
- Enter your username as khifast\K23-xxxx and its assigned password.
- Zip folder needs to be pasted in the "Exam Submission\teacherName" folder.

Time: 120 minutes.

Max Marks: 120 Points

PAPER TYPE B

Question#1

[20 mins, 20 Points]

You are required to develop a Bill Calculating Application system for All Super Mart using switch case that would display the following list of items along with name and associated price After selecting an item, the Application should keep track of the total bill calculated and check if the customer has inserted enough money to purchase the selected items. If the customer cancels the selection, the Application should return their money. The vending machine should provide change when necessary. After finalizing the transaction, customers have to insert the amount to pay the bill. If inserted amount is less than total bill calculated then Program should prompt the user that money is insufficient to pay.

Write a C Application, that can handle the insertion of both Rupees and bills. Ensure that the Application accurately calculates the change and maintains a running total of the amount of items. Also, handle the case where the user enters more money than needed for the selected item. Also count how many times each item is purchased. If cola is purchased two times, then its count must be two, and so on. Then display the total count of every item.

This Application should provide correct change even when the user inserts a bill for a low-priced item. Also handle that if no item is purchased then total bill must be 0.

This Application can handle both Rupees and bills, handle user cancellations, and provide correct change, even when the customer inserts a bill for a low-priced item.

Demonstration:

Welcome to the C Application

Super Mart Menu:

1. Cola - Price: 70 Rs.
2. Chips - Price: 120 Rs.
3. Candy - Price: 50 Rs.
4. Water - Price: 50 Rs
5. Cancel
6. Finish and Collect Change

Your Bill Reaches to : 0.00

Enter your Choice from { 1-6}:

Question#2

[40 mins, 20+20=40 Points]

- a) You're managing a charity event with three distinct causes: education, healthcare, and environment. Attendees can donate amounts from 1 to 100. However, there's a rule for donation allocation:

For each donation amount, you need to calculate the square of that number.

If the squared result is a prime number, then the donation amount contributes to education. If the squared result is divisible by 5, it contributes to healthcare. If it's a perfect square, it contributes to the environment.

Calculate the total amount collected for each cause, considering the square of each donation, while adhering to these allocation rules. If total donation for education is more than health care then balance these both donations give some donation to the health care so that both have same amount of donation and vice versa. If both are already equal do no thing. At the end, calculate the total donation collected.

Create a C program to solve this task.

- a) Suppose you are a cashier in a small retail store, and your manager asks you to find out the unique products that were sold today to determine which items are the bestsellers. You have a record of all the items sold, but some products may have been sold more than once.

In this case, you need to create a program to identify and display the list of unique products sold today, so that the manager can analyze the data effectively and make informed decisions about inventory and promotions. The program ensures that no product is listed more than once in the final report.

You are required to take array of N size as user input that contains product IDs as whole number. The array may contain the duplicates IDs also. Write the C program to find out the unique IDs from given set of IDs.

Input:

Given Array IDs: 15 12 17 12 18 15 19 11 17

Output:

Unique IDs: 15 19 11 are Unique.

Question#3**[60 mins, 60 Points]**

You are working on a C program to process a grayscale image represented as a 2D array of NxN size. Each element in the array indicates the brightness of a pixel, with values ranging from 0 to 255. Your goal is to improve the image in several ways:

1. Calculate the total brightness of the entire image. This gives you an idea of the image's overall brightness.
2. Calculate the average brightness of the entire image. This gives you an idea of the image's overall brightness.
3. Identify and count the number of "Bright" pixels in the image. These are pixels with a brightness value of 200 or higher.
4. Calculate the total brightness of "Dark" pixels in the image. Dark pixels have a brightness value below 100.
5. Find the darkest pixel and note its coordinates.

If there are more than 5 darkest pixels, consider these areas for improvement.

For each of these darkest pixels, search for adjacent pixels (up, down, left, and right) with a higher brightness value. If you find such a brighter adjacent pixel, then replace the darkest pixel's value with the brighter pixel's value. after that output the new updated image and print it.

Formula for: $\text{averageBrightness} = \text{totalBrightness} / (\text{height} * \text{width});$

Input: Original Image:

100 150 200 50
75 110 210 30
160 180 90 190
40 60 70 120

Output

Average Brightness: 114
Number of Bright Pixels: 2
Total Brightness of Dark Pixels: 415
Number of Darkest Pixels: 7
Darkest Pixels: Value =30, Coordinates= (1, 3)
Image After removing Darkest Pixels:
100 150 200 200
160 110 210 210
160 180 210 190
160 180 210 210

You have studied really hard. So be confident and do well in your exam.

Good Luck.