National University of Computer & Emerging Sciences, Karachi
Spring-2020 Computer Science Department
Final Exam

Course Code: CS118	Course Name: Programming Fundamentals
Instructor Name:	Ms. Tania Iram /Ms. Farah Sadia/Ms. Atiya Jokhio

Instructions:

READ carefully the following instructions before attempting the paper.

- The **Final Exam** consists of **eight** questions. Be sure that you have all of these and that they are all legible.
- Read all questions and their instructions thoroughly before you begin. It is always worth your time to plan ahead!
- Write your **roll number, section** accompanied by your **signature** on each page.
- The Final Exam is worth 50 weightage.
- Points will be awarded based on your explicit answers. Partial credit will be given where possible, so show all of your work.
- Read the question properly, you can't find it on google so **"don't waste your time"**. It's easy.
- You are supposed to make a program according to the question.
- Don't share your work, if your submission is matched to any member of your class, both will be marked 0 straight without asking who shared or who magically copied.
- You have to "ATTEMPT ON Paper".
- In case of non availability of internet due to load shedding etc, mobile data should be good enough to download and upload files. You do not need the internet during 3 hour offline exams. So better, fully charge your mobile battery and ready to upload data using mobile in case of emergency.
- **180 minutes** is for an exam to attempt, **30 minutes** for pdf formation and submission on LMS (Slate/ Google Classroom). If you find some problem with LMS, don't waste your time and email your theory teacher with the subject: **FINAL_DS_SectionName**. Also submit the same later to LMS as well.
- Email Addresses are: **farah.sadia@nu.edu.pk || tania.iram@nu.edu.pk || atiya.jokhio@nu.edu.pk**
- Submissions after **12:30 pm** are considered **late**. There is a **penalty** for late submission i.e **deduction of 5 points for 10 minutes** late submission.

Time: 180 minutes (to attempt) + 30 minutes (to submit) **Max weightage**: 50

Question # 01: ***[Points: 04],*** *Time: 15 minutes*

Welcome to the **"Pie in the Sky"** bakers. The customer wants to buy some combination of bakery items like any single item, or two items for example; cake and biscuits. Write a program that displays the following menu for the bakery items available to take order from the customer using IF and Switch case statements.

C = Cake (Rs. 500)

B= Biscuits (Rs. 200)

The program first asks to enter the no of categories of bakery items i.e. 1 or 2, then it asks to enter the choice i.e. 'C' for Cake, 'B' for Biscuits and then for quantity. If the customer asks for other than menu

items, it shows a message of the unavailability of items on bakers. The program should finally display the total charges for the order. Example input/output data is given:

```
                                    PIE IN THE SKY BAKERS
                                        WELCOME

PLEASE SELECT FROM THE FOLLOWING MENU
C = CAKE
B = BISCUITS
HOW MANY TYPES OF BAKERY ITEMS YOU NEED TO ORDER = 2
Enter first item you want to order = B
enter quantity = 3
Enter second item you want to order = C
enter quantity = 2

--------------------------------------------------

you have ordered
2 Cakes    = 1000
3 Biscuits      = 600
        TOTAL = 1600

                Thank u have a nice day
```

Question # 02: *[**Points: 04**], Time: 20 minutes*

Print your nic number string on the screen diagonally using nested loops by following the algorithm. Program should separate and add the individual digits of middle part of your NIC number ex. NIC number Input= "42213-1509923-0". The program will input the whole NIC string 42213-1509923-0 and the middle number 1509923 and after separating the digits of the middle numbers add the digits to get the sum :1+5+0+9+9+2+3=29. Divide the sum by three using integer division which gives e.g. 29/3 =9. Now print your whole nic strings individual characters diagonally upto the final result i.e. 9 lines. Give the dry run of the whole algorithm:

```
Enter your nic number without spaces:4211315099230
enter the middle part of nic
1509923
Digits sum divided by 3 is 9
Now the diagonal printing of NIC string is

4
 2
  1
   1
    3
     1
      5
       0
        9
```

Question # 03: *[**Points 06 = 3+3**], Time: 20 minutes*

A SuperMarket wants to maintain the record of customer visits, items available and quantity of items. Suppose you are a software designer of that software house and you are assigned to do this task using structure and filing. Following are the requirements of the supermarket's owner :

a) The worker has to maintain the record of 'n' customers in (customer_details.txt) file.
b) Customer details include: a customer ID (type int), a customer Name (type string), Customer address (consisting of street address, city, state). Hint: Structure nesting is required in address field. [The user has to input all the data].

c) The worker has to maintain the ID of Product, Name of Product, Quantity of Product in (Product_details.txt) file. He should take the input from the user until the user enters 'EOF'.

Further, the worker should have menu to select any option out of the given three below:

i) list out all the maintained items.
ii) list only those items whose quantity is zero.
iii) list only those items whose quantity is greater than fifty.

Question # 04: ***[Points 10 = 2+2+2+2+2]****, Time: 30 minutes*

During Covid-19 spread, civil hospital has to manage budget for its 6 departments. Its account manager has to track expense report : department-wise and month-wise from January to May in the following format:

Expense report

==========

Department	January =======	February ========	March ========	April =======	May =======	**Total ======**
Surgery	27000.50	34000.50	45000.50	50000.50	50000.00	240002
Emergency	29000.50	27000.55	36000.00	36000.50	37000.50	201002.6
Skin	27000.50	36000.00	27000.00	36000.50	22000.50	170002
Covid-19	36000.50	36000.50	39000.50	27000.00	22000.00	182002
Dentistry	27000.50	36000.55	36000.00	22000.00	27000.00	170001.1
Total	146002.5	169002.1	183001	171001.5	158001	

Write a program using 2-dimensional arrays to hold the expense month-wise and department-wise.

a. Department and Months names should be stored and displayed using array of string pointers.
b. Modular programming should be used i.e. input-data(parameters list..),output data(parameters list…), department-wise-total(parameters list…),month-wise-total(parameters list…) should be used to generate report.
c. 2D array holding expenses should be passed from main to all functions by reference.
d. Calculate and display based on data, which department will need federal support i.e. expenses higher than 50,000.

e. Display which month was stable in terms of expenses i.e having the lowest monthly expense

Question # 05: *[**Points: 04**], Time: 20 minutes*

Consider: **Two trains** are on the same track and they are coming toward each other. The speed of the first train is **50 km/h** and the speed of the second train is **70 km/h**. A honeybee starts flying between the trains when the distance between two trains is **100 km**. The honeybee first flies from first train to second train. Once it reaches the second train, it immediately flies back to the first train … and so on until **trains collide**. Calculate the total distance travelled by the honeybee. Speed of a honeybee is **80 km/h**. Distance formula is given below.

Total distance travelled by honeybee: **(honeybee speed * distance)/(train_1 speed + train_2 speed)**

Your task is to solve the problem **recursively (direct or indirect)**.

Question # 06: *[**Points 08: 1.5+1.5+1+2+1+1**], Time: 20 minutes*

Consider a two player game, Player A and Player B. Both the players get the turn one by one and choose a box randomly. There should be an even number of boxes so that both players can have an equal number of turns. Every box has some label in terms of 1,2,3...6 and inside of every box has some cash.

Game Rules:
If player A chooses box "1" and opens it then, Player B can not have the opportunity to open box "1". Once the box is opened that is no longer available to open again.
For each box make sure to allocate the memory dynamically in the main() and initialize cash of each box randomly by using rand(), pass to the user defined function "Jeet_ki_bazi()" play the complete game turn by turn in this function and calculate sum of each player's cash . Return the both player cash values to the main function without using any array or static variable. Use the two individual variables for total cash of each player. After returning to main() use the ternary operator to make a decision which player won the game and display the player name with "Congratulations on your well-deserved success".
For example the number of boxes are 6 and are placed in front of you on a table. At the end sum the all cash of each player. The player that collects maximum cash with more value wins the game.

Initial row: 28 22 10 33 19 40	
Round #	***Process***
Round 1:	***Player A picks box 1: which has 28 rupees, now remaining boxes of cash is*** ***After first pick: 22 10 33 19 40***

	Player B picks box 4: which has 33 rupees, now remaining boxes of cash is
Round 2:	***After second pick: 22 10 19 40*** ***Player A picks box 6: which has 40 rupees, now remaining boxes of cash is*** ***After third pick: 22 10 19*** ***Player B picks box 2: which has 22 rupees, now remaining boxes of cash is***
Round 3:	***After 4th pick: 10 19*** ***Player A picks box 3: which has 10 rupees, now remaining boxes of cash is*** ***Last pick: 19*** ***Player B picks box 5: which has 19 rupees, game over.***
Total:	***The total value collected by Player B is more (33 + 22 + 19) compared to the first player (22 + 40 + 10). So the second picker, Player B wins. Congratulations on your well-deserved success.***

Question # 07: ***[Points: 04]****, Time: 20 minutes*

Write an ethical paragraph corrector program which accepts two to three lines of text as input. After tokenizing the text, the program checks for a list of unethical words and replaces them with some ethical words. For this purpose the program tokenize, compares words and modifies the input string into output string by replacing the words: stupid, ugly, pathetic, Alas etc. An example is shown to demonstrate:

```
Enter an input string:
this is Martin the stupid . Full of ugly and pathetic ideas . Alas , he is here
today.

Output string: this is Martin the  the great . Full of  vibrant and  shiny ideas
 .  Wow , he is here today.
```

Hint: you may use string.h functions for string comparing and tokenizing

Question # 08: ***[Points 10: 3+2+3+2]****, Time: 25 minutes*

Sara and **Humna** are best friends. Sara lives in **joint family system** and Humna lives in **nuclear family System**. Humna said to Sara,"**She loves the joint family system**". Sara has a small house and her father is daily wage labour. Sara lives with **1 younger sister, 2 elder brothers, father, mother , grand father and mother, paternal uncle and aunty**.

Sara has 10 family members overcrowded in the 2 room house with 4 people having corona. Now our task is to separate corona patients from non-corona patients so that the ones having corona can be shifted to another room and doctors can then deal with these patients accordingly.

Your task is to design a two array of size 10 for all family members, one for name and one for COVID-19 status in terms of positive and negative in main() and initialize the details of each family member. Use the bubble sort algorithm for sorting. Sort the record according to the COVID status. You should design the three functions one for display records, one for swapping and one for bubble sort passes/epochs/iteration. All three function names are **DISPLAY()**, **SWAP()** and **BUBBLE_SORT()**. Pass the two arrays to the BUBBLE_SORT(). Don't call any function directly from anywhere. You must use function pointer technique for all three functions calling.

Unsorted:	Name:{”Hina”,”Sara”,“Ali”,”Zain”,”Bakhtawar”,”Hashim”,”Zeeshan”,”Jameela”,”Asfa”,”Zahid”} Covid:{“P”,”N”,”P”,”P”,”N”,”P”,”,”N”,”N”,”N”,”N”}
Sorted:	Name:{”Hina”,“Ali”,”Zain”,”Hashim”,”Sara”,”Bakhtawar”,”Zeeshan”,”Jameela”,”Asfa”,”Zahid”} Covid:{“P”,”P”,”P”,”P”,”N”,”N”,”,”N”,”N”,”N”,”N”}