NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCESISLAMABAD CAMPUS

Programming Fundamentals - FALL 2023

ASSIGNMENT- 2

Due Date: **Friday 13th October 2023 at 11:59 pm**

Please follow the following submission instructions. Failure to submit according to the format would result in a deduction of marks. Submissions other than Google classroom (e.g., email etc.) will not be accepted. No late submission will be accepted. Correct and timely submission of the assignment is the responsibility of every student; hence no relaxation will be given to anyone.

Instructions: **Total Marks: 190**

1. Assignments are to be done individually. You must complete this assignment by yourself. You cannot work with anyone else in the class or with someone outside of the class. The code you write must be your own and you must have an understanding of each part you code. You are encouraged to get help from the instructional staff through email, on google classroom or individually visiting their respective offices.
2. The AIM of this assignment is to give you practice with operators (bitwise, arithmetic, logical , relational) and conditional statements in C++.
3. Use appropriate data types, operations, and conditional structures for each problem. You cannot use advance constructs like **loops** / **arrays** for this assignment.
4. No late assignments will be accepted.
5. Displayed output should be well mannered and well presented. Use appropriate comments and indentationin your source code.

Honor Policy

This assignment is a learning opportunity that will be evaluated based on your ability. Plagiarism cases will be dealt with strictly. Plagiarism of any kind (copying from others, copying from the internet etc.) is **not** allowed. If found plagiarized, both the involved parties will be awarded zero marks in this assignment, all the remaining assignments, or even an F grade in the course.

Submission Guidelines

1. Dear students, we will be using auto-grading tools, so failure to submit according to the below format would result in zero marks in the relevant evaluation instrument.
2. For each question in your assignment, make a separate cpp file e.g., for question 1, make q1.cppand so on. Each file that you submit must contain your name, student-id, and assignment # on top of the file in the comments.

3. Combine all your work in one folder. The folder must contain only .cpp files (no binaries, no exe files etc.).
4. Rename the folder as ROLL-NUM_PROGRAM_SECTION (e.g., 23i-0001_AI/DS_B) and compress the folder as azip file. (e.g., 23i-0001_AI_B.zip).
5. Submit the .zip file on Google Classroom within the deadline.
6. The student is solely responsible to check the final zip files for issues like corrupt file, virus in the file, mistakenly exe sent. If we cannot download the file from Google classroom due to any reason it will lead to zero marks in the assignment.

Note: Start early so that you can finish it on time.

Problem 1: **(10 marks)**

An egg distribution company uses different sizes of packings for eggs, that is, 30 eggs packing, 24 eggs packing, 18 eggs packing, 12 eggs packing and 6 eggs packing. Write a program which prompts the user to enter the total number of eggs (input validation is always must) to be packed and then calculate how many packings of each size will be possible. Also tell if there will be any eggs left to be packed.

Sample Output:

Enter total number of eggs: 100

Number of 30 eggs packing: 3	Number of leftover eggs: 10
Number of 24 eggs packing: 4	Number of leftover eggs: 4
Number of 18 eggs packing: 5	Number of leftover eggs: 10
Number of 12 eggs packing: 8	Number of leftover eggs: 4
Number of 6 eggs packing: 16	Number of leftover eggs: 4

Problem 2: **(5 marks)**

Write a C++ program to calculate the given below formula. The Value of i Needs To be input by user while u = 1.234 and p = 3.334.

$$\frac{\sqrt{\mu(i)^{\frac{3}{2}}(i^2-1)}}{\sqrt{\rho(i)-2}+\sqrt{\rho(i)-1}}$$

Note: Consider positive values only

Problem 3: **(10 marks)**

Write a program, which takes short (16-bit integer) value as an input from user and multiply it with 63. Remember, you can only use bitwise operators for this problem.

Problem 4: **(15 marks)**

Time field in the directory entry is 2 bytes long. Distribution of different bits which account for hours, minutes and seconds is given below:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
H	H	H	H	M	M	M	M	M	M	S	S	S	S	S	S

Write a C++ Program that take input two-byte time entry and appropriately separates hours, minutes and seconds using suitable bitwise operators. Think cleverly. The program executes in following manner:

```
Enter a two-byte Time Value: 4879

Time is 1 hrs 12 mins 15 secs
```

Problem 5: **(15 marks)**

When we draw money from an ATM machine it asks us to specify the total amount that we wish to withdraw. The machine (the program running on a computer) then decides the number of currency notes of each denomination that (i.e., Rs. 500, Rs. 1000, Rs 5000) that must be given to the user in order to fulfil his request. In this problem, you will write a program that will ask the user to enter the total amount the user wants to withdraw and then display the number of currency notes of each denomination that will be given to the user. Please remember that following rules must be followed while making the decision about the number of currency notes of each denomination.

Rule No 1. The user must be given at least one note of Rs. 500.
Rule No 2. The machine must give a minimum number of currency notes to the user.
Rule No 3. Total amount specified by the user must be less than withdraw limit.
Note: Daily withdraw limit is 50,000.
Rule No 4. Total amount specified by the user must be a multiple of Rs. 500.

Problem 6: **(15 marks)**

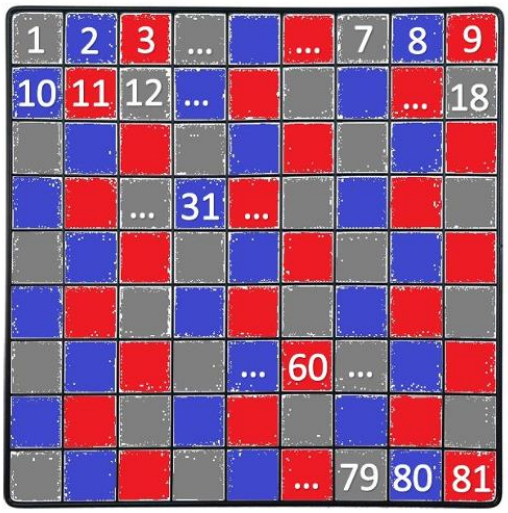
Consider a factory where the employees can be categorized into three types 1) Full-time 2) Part-time, and 3) Adhoc. An employee who works for 25 to 30 days of the month is considered as full-time employee, 15 to 24 days is considered as Part-time employee, and the employee is considered Adhoc if he works for less than 15 days.

Write a C++ program that calculates the salary of the employee, tax deductions, and net-payable amounts. Also, the program should print expected salaries of Full-time, Part-time, and Adhoc employees. Consider a working day equal to 8 hours. The program should take input of employee's data as the number of days. The tax deducted and payment rates are as follows:

Full-Time employee (900 per hour, 5% tax deduction), Part-time (850 per hour, 7% tax deduction), and Adhoc (600 per hour, 10% tax deduction).

Problem 7: **(15 marks)**

You are given a 9*9 grid as shown in the figure below. Write C++ program to take two numbers from the grid and will determine if the two squares entered in this 9*9 grid have same color or not. If both colors are same, then display name of that color.



Problem 8: **(10 marks)**

The date June 10, 1960, is special because when we write it in the following format, the month times the day equal the year.

6/10/60 6×10=60

Write a C++ program using a ternary operator only that asks the user to enter a month (in numeric form), a day, and a four-digit year. The program should then determine whether a month times the day is equal to the year (consider last two digits). If so, it should display a message saying the date is magic. Otherwise, it should display a message saying the date is not magic.

Problem 9: **(20 marks)**

Write a C++ program that generates a **math exercise** for the user. The program should first ask for which operation an exercise should be generated. The Possibilities are **addition (+), subtraction (-) , multiplication (*) , and division (/).**

After selecting an operation, the user should answer the following question:

What is the maximum value for the input values of the exercise?

The answer to this question must be stored in a variable maximumValue.

Next, the program should ask.

Are negative values allowed in the exercise?

The possible answers for the question are "Y" and "N ".

The program will then generate two random numbers. If the user allows negative values, the random numbers must be generated in the range from **- maximumValue** to **+ maximumValue**. If the user allows only positive values, the range is restricted from **0 to maximumValue**. Moreover, if only positive numbers are allowed and subtraction was chosen, the second random value must be less than the first random value.
Finally, the program will show the generated exercise, depending on the chosen operation and the numbers randomly generated, and ask the user for the correct solution. If the user solves the exercise correctly, the program will print out a congratulatory message.

Problem 10: **(25 mark)**

Write a program that displays the following menu:Guessing games.

1. Play Higher or Lower
2. Play paper - scissors - rock
3. Guess the numbers
4. Quit

Enter your choice (1 - 4)

If the user enters 1, the program should generate two random numbers between 1 and 20 and display the first number. It should then ask the user to enter either H or L for Higher or Lower. The user wins if they entered and the second number was higher than the first or when they entered L and the second number was lower.

If the user enters 2, the program should generate one random number between 1 and 3 with 1 corresponding to paper, 2 to scissors, and 3 to rock. The program should then ask the user to enter P for paper, S for scissors, or R for rock. The program should then display who won the computer or the user.
Rule: Scissors beats paper, rock beats scissors, and paper beats rock.

Finally, if the user enters 3, the program will generate three random numbers each between 0 and 9. The user should guess three numbers and the program should compare each of the user's guess to the three generated random numbers and display an appropriate output based on whether they got:

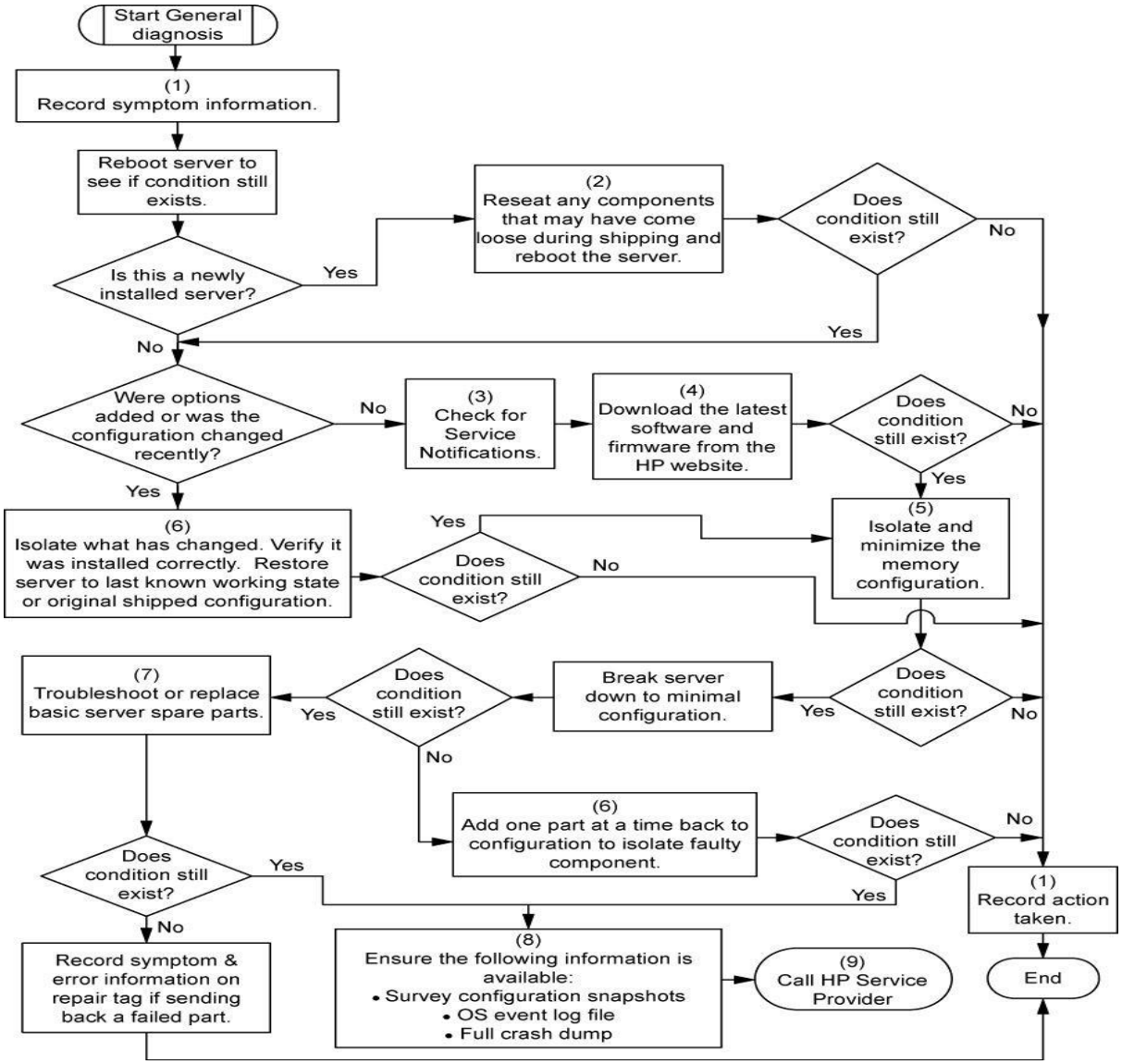
a. Anyone matching.
b. Two matching
c. Three matching, not in order
d. Three matching in exact order
e. Or no matches at all

Input Validation: Display an error message if the user enters a number outside the range of 1 through 4 when selecting an item from the menu. Do not accept characters other than H or L for Higher / Lower, P, S, and R for paper - scissors - rock, or a value outside the range from 0 to 9 for guessing numbers.

Problem 11: **(30 marks)**

The below mentioned figure shows a general diagnosis flowchart for troubleshooting HP servers Use the flowchart to create a C++ program that leads a person through the steps of fixing a bad HP server. Here is an example of the program's output (following one of the flows):

Starting General Diagnosis Program.
Recoding symptoms information -
DONE.
Rebooting server to see if condition still exists -
DONE.Is this a newly installed server? **yes [enter]**
Please reseat any components that may have come loose during shipping -
DONE.Rebooting the server - DONE.
Does the condition still exist? **no [enter]**
Recording all actions taken for future - DONE.
Congratulations, your server problems are solved.
Notice the program ends as soon as a solution is found to the problem.



Problem 12: (IESCO Bill) **(20 marks)**

A copy of IESCO bill is given below. See all details in the bill carefully. Your task is to correctly understand each data type, inputs, outputs, fixed billing rates, taxes, etc. Write a C++ calculate correct bill amount. Your output should be formatted as close as possible with the template of the bill. Use of iomanip library for formatting also carries marks.

Initialize fields with the following data at the start of program.

Connection date: 28 Dec 11
ED@: 0
Bill Month: Oct 21
Reading Date: 02-Nov-21
Issue Date: 03-Nov-21
Due Date: 17-Nov-21
Consumer ID: Your date of birth

Suppose your date of birth is 20-07-2003 then consumer id will be 20072003 (DDMMYYYY)

Tarrif: A-1a(01)
Load: 2
Old A/C Number: 0
Division: Westridge
Sub Division: Tarnol pesh RD
Feeder Name: Nust Road
Reference No: Your Roll Number (e.g 23i1234)
Name & Address: Your Name and Address

Note: Take both inputs separately.

Meter No: 123456
Previous: 9742
Present: 9942
MF: 1
Units/ Units Consumed: Consider last four digits of your roll number.

Suppose your roll number is 23i-1234 then value of units will be 1234.

Cost of electricity: Calculate according to units consumed.

Note: Cost of 1 unit is 20 (fixed for all units).

Fuel Price Adjustment: 700
F.C Surcharge: 90
QTR Tarrif: -14
Total 1: Calculate according to above mentioned values.
TV Fee: 35
GST: 800
GST on FPA: 108
Total 2: Calculate according to above mentioned values.
Current Bill: Add values of Total 1 and Total 2
Total FPA: 700

Payable within due date: Add Total FPA in Current Bill
L.P.Surcharge: 400
Payable after due date: Add L.P.Surcharge in Calculated bill

Remaining fields will be empty.

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YOUR BETTER SERVICE - OUR PRIDE

ELECTRICITY CONSUMER BILL

IESCO GST No. 26-00-2716-001-91

www.iesco.com.pk

CONNECTION DATE	CONNECTED LOAD	ED@	BILL MONTH	READING DATE	ISSUE DATE	DUE DATE
28 DEC 11		0%	Oct 21	02-NOV-21	03-NOV-21	17-NOV-21

CONSUMER ID	TARIFF	LOAD	OLD A/C NUMBER	DIVISION	WESTRIDGE
1142069075	A-1a(01)	2	15143574030200	SUB DIVISION	TARNOL PESH RD
REFERENCE NO	LOCK AGE	NO of ACs	UN-BILL-AGE	FEEDER NAME	NUST ROAD
15 14357 5104800 U				Web Generated Bill	

NAME & ADDRESS
ARANGZEB
S/O MUHAMMAD KHAN
DHOKE SULMAN
IBD

Say No To Corruption

METER NO	PREVIOUS READING	PRESENT READING	MF	UNITS	STATUS
S-P 129624	9742	9942	1	200	

بجلی سے متعلق تمام شکایات کے جلد ازالے یا بل اور لوڈشیڈنگ کی تفصیلات کے لئے پہلی فرصت
میں اپنے بل کا حوالہ نمبر لکھ کر 8118 پر میسج کریں یا 118 پر کال کریں

TEXT Reference No to 8118
or Call 118

MONTH	UNITS	BILL	PAYMENT
OCT20	142	2097	2097
NOV	124	1717	0
DEC	125	3103	3103
JAN21	93	881	881
FEB	89	1076	1076
MAR	118	1309	1309
APR	141	1561	1561
MAY	212	2666	0
JUN	300	6853	6628
JUL	234	2990	2990
AUG	361	6557	6557
SEP	325	6024	6024

IESCO CHARGES

UNITS CONSUMED	200
COST OF ELECTRICITY	1780
METER RENT	
SERVICE RENT	
FUEL PRICE ADJUSTMENT	705.36
F.C SURCHARGE	86
T.R SURCHARGE	
QTR TARRIF ADJ/DMC	-14
TOTAL	2557.36

GOVT CHARGES

ELECTRICITY DUTY	0
TV FEE	35
GST	315
INCOME TAX	
EXTRA TAX	
FURTHER TAX	
N.J SURCHARGE	
R-STAX	

TOTAL CHARGES

ARREAR/AGE	
CURRENT BILL	2202
BILL ADJUSTMENT	
INSTALLEMENT	
SUBSIDIES	
TOTAL FPA	824.36
PAYABLE WITHIN DUE DATE	3026
L.P.SURCHARGE	185
PAYABLE AFTER DUE DATE	3211

BILL CALCULATION

GOP

Tariff		Units
07.7400	X	100
10.0600	X	100

GST ON FPA	119
ED ON FPA	
FURTHER TAX ON FPA	
S.TAX ON FPA	
IT ON FPA	
ET ON FPA	
TOTAL TAXES ON FPA	119
TOTAL	469
DEFFERRED AMOUNT	
OUTSTANDING AMOUNT Fix Charges	0
PROG. IT PAID F-Y	

Fuel Price Adj for AUG-21 @ 1.9539 /KWH

PROG. GST PAID F-Y

FOR COMPLAINT CONTACT

Center
Ph # : 9247625
Center Name : CHITTIABAD

SMS @ 8118 OR Call 118

CUT HERE

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CONSUMER ID	1142069075

BILL NO 203732

BANK STAMP

****** Good Luck ******