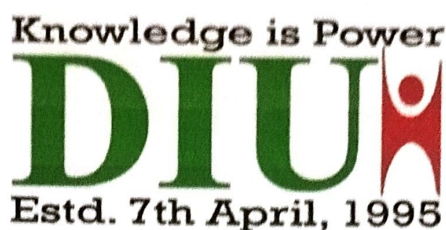


Dhaka International University



DEPARTMENT OF CSE

LAB REPORT

COURSE NAME : *structured programming language lab*

COURSE CODE : *0613-L02*

REPORT NO : *06*

REPORT ON : *simple calculator and quadratic equation solver in c programming.*

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DATE OF SUBMISSION : *26 October, 2024*

Date of Performance : *21 September, 2024*

📌 Title : Simple calculator and Quadratic Equation Solver in C programming.

📌 Objective : The objective of this lab report is to:

01. Develop a simple calculator in C using the switch statement to perform basic arithmetic operations: addition, subtraction, multiplication and division.

02. Implement a quadratic equation solver using conditional statements to determine the roots of the equation based on the discriminant value.

📌 Introduction : These program showcase the use of conditional logic and switch statements in C for implementing a calculator and a quadratic equation solver.

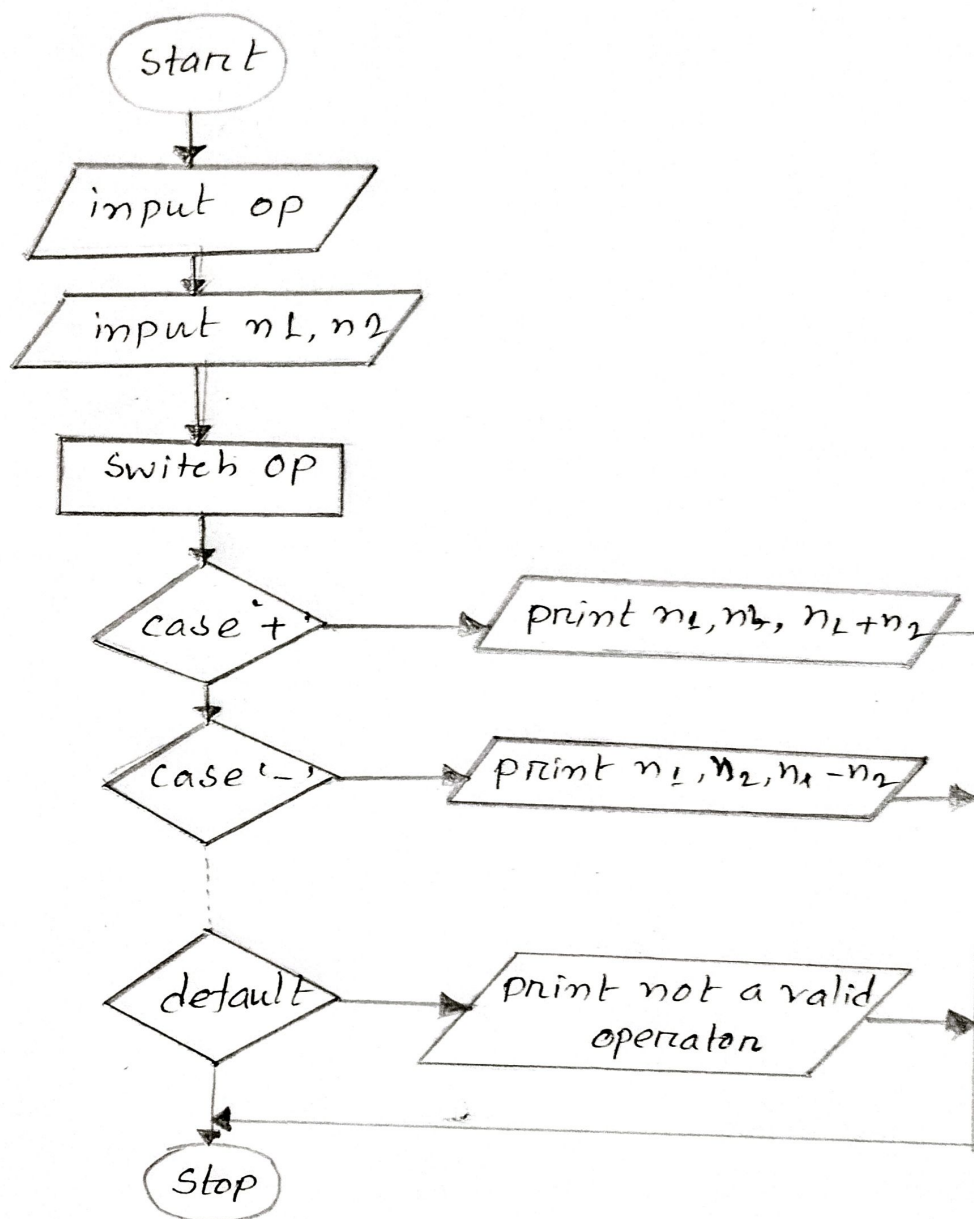
... Simple Calculator Program :

- Explanation : The calculator program takes an operator and two numbers as input from the user, then perform the selected operation using a switch statement.

- Algorithm :

- Declare local variables $n1, n2, ch$. For example, where $n1, n2$ take two numeric values and ch variable defines the operator symbols.
- Enter the operator you chose for your operation and give two numbers.
- Switch case jump to an operator selected by the user.
- Display the operational result.
- Exit from the program.

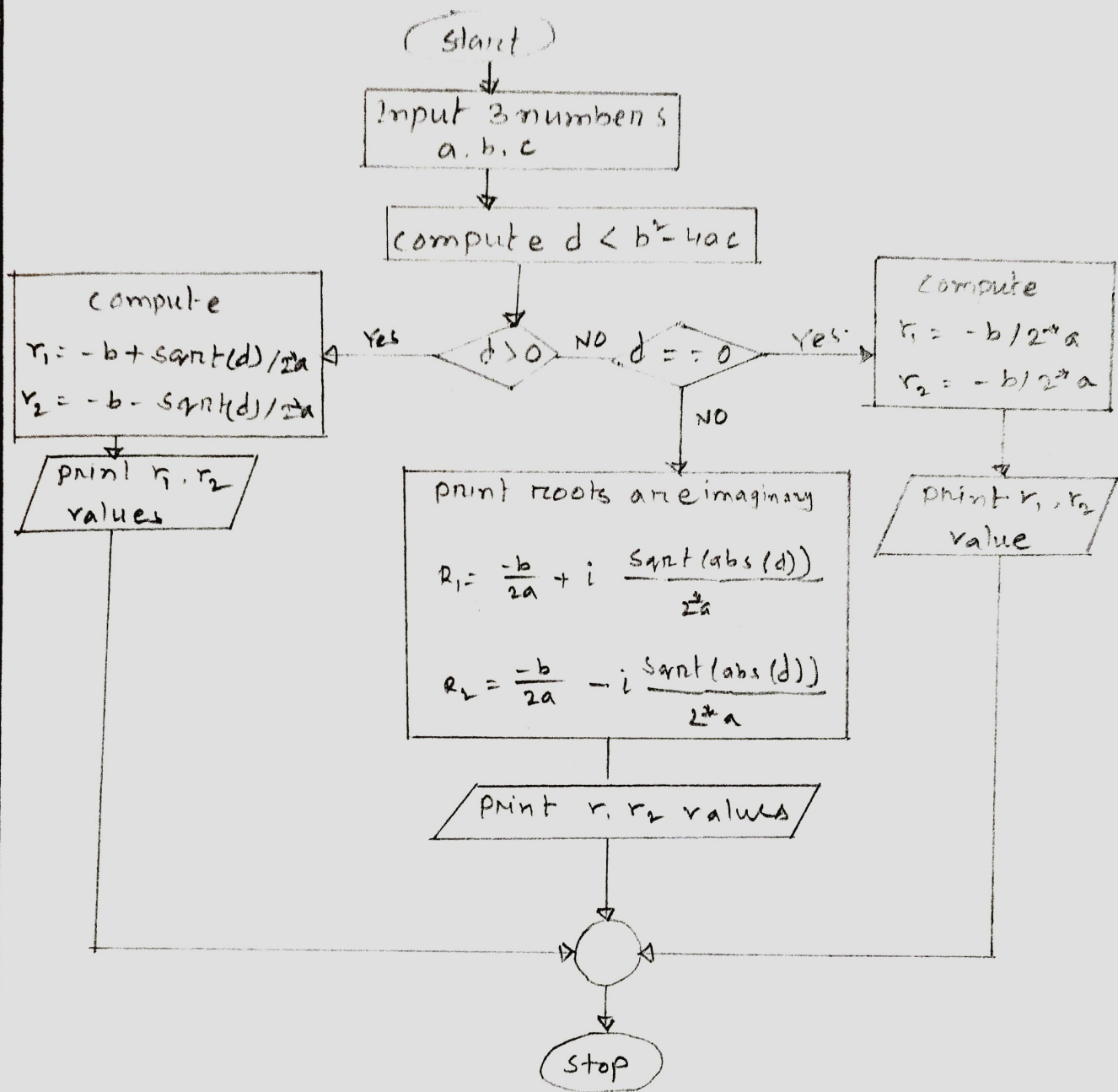
- Flowchart:



... Quadratic Equation Solver program:

1- Explanation: The program calculates the roots of a quadratic equation $ax^2 + b + c = 0$. It uses the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ and checks the discriminant $b^2 - 4ac$ to determine the types of roots.

-Flowchart :



Algorithm :

- start
- input a, b, c
- calculate $d = (b*b - 4*a*c)$
- Is $(d > 0)$:
 - Yes , print roots are real and different
 $r_1 = \frac{-b + \sqrt{d}}{2a}$, $r_2 = \frac{-b - \sqrt{d}}{2a}$
 print r_1, r_2 values and end.

- No, go to next step.
- If $(d == 0)$:
 - Yes, prints roots are real and same
 $r_1 = -b/2*a$, $r_2 = -b/2*a$
 print r_1, r_2 values and end
 - No, go to next step
- otherwise:
 - Yes, print roots are imaginary
 $r_1 = (-b)/2*a + i (\text{sqrt}(\text{abs}(d))/2*a$
 $r_2 = (-b)/2*a - i (\text{sqrt}(\text{abs}(d))/2*a$
 print r_1, r_2 values and end.

▣ Discussion: In this section we will learn about the presentation of code, output and Explanation of the code. The shown code will be as in IDE and the output will be as in console.

Simple calculator program:

... code:

```
#include <stdio.h>
```

```
int main () {
```

```
    double n1, n2;
```

```
    char ch;
```

```
    printf("Enter an operator : (+, -, *, /) \n :- ");
```

```
    scanf("%c", &ch);
```

```
    printf("Enter Two numbers : ");
```

```
    scanf("%lf", &n1, &n2);
```

```
    switch (ch){
```

```
        case '+': {
```

```
printf ("%0.2lf + %0.2lf = %0.2lf \n", n1, n2, n1+n2);  
break;}
```

```
case '-':{
```

```
printf ("%0.2lf - %0.2lf = %0.2lf \n", n1, n2, n1-n2);  
break;}
```

```
case '*':{
```

```
printf ("%0.2lf * %0.2lf = %0.2lf \n", n1, n2, n1*n2);  
break;}
```

```
case '/':{
```

```
if (n2 != 0){
```

```
printf ("%0.2lf / %0.2lf = %0.2lf \n", n1, n2, n1/n2);  
}
```

```
else {
```

```
printf ("undefined m");  
}
```

```
break
```

```
}
```

```
default:
```

```
{ printf ("Not a valid operation \n");
```

```
}
```

```
}
```

```
}
```

... output:

Enter an operator : (+, -, *, /) :- +

Enter Two numbers : 2 5

2.00 + 5.00 = 7.00

Find roots of quadratic equation program:

... code:

```
#include <stdio.h>
#include <math.h>
#include <stdlib.h>
int main()
{
    double a = 1, b = 2, c = 3, r1, r2;
    double d;
    d = b*b - 4*a*c;
    if (d == 0)
    {
        printf("Roots are real and same\n");
        r1 = -b/2*a;
        r2 = r1;
        printf("Root 1: %.1f\nRoot 2: %.1f\n", r1, r2);
    }
    else if (d > 0)
    {
        printf("Roots are real but different\n");
        r1 = (-b + sqrt(d)) / 2*a;
        r2 = (-b - sqrt(d)) / 2*a;
        printf("Root 1: %.1f\nRoot 2: %.1f\n", r1, r2);
    }
    else {
        printf("roots are imaginary\n");
        double f1, f2;
        f1 = -b / (2*a);
        f2 = sqrt(abs(d)) / (2*a);
        printf("Root 1: %.1f + i %.1f\n", f1, f2);
        printf("Root 2: %.1f - i %.1f\n", f1, f2);
    }
}
```

...output :

Roots are imaginary

Root 1: $-1.0 + i 1.414214$

Root 2: $-1.0 - i 1.414214$

Conclusion: These programs demonstrate the practical application of conditional state-ment (switch and if-else) in c programming for solving basic problems. The calculator performs simple arithmetic operations, showing how switch statements can handle different cases efficiently, while the quadratic equation solver uses if-else to determine the nature of the roots based on the discriminant. Though limited to basic operations, these programs provide a foundational approach to handling user input making decisions in programs serving as essential tools for more complex computational tasks.

References :

- openai.com
- learn.microsoft.com
- github.com
- C standard library Documentation.