Introduction:

Mathematical operations play a major role in our daily lives. In our daily life, we will be involving with different types of calculations. Ordinary calculator is used to solve basic mathematical operations. For physics, chemistry, advanced mathematics, etc such calculators are sometimes insufficient. Advanced problems can be solved with functions such as logarithm, exponential, trigonometric, hyperbolic, etc. Calculator operations such as addition, subtraction, multiplication, division, modulus, factorial, square, cube, square root, cube root, inverse, natural log, log, exponential, power, trigonometric, inverse trigonometric, hyperbolic, inverse hyperbolic are implemented using C language in this project.

Objective:

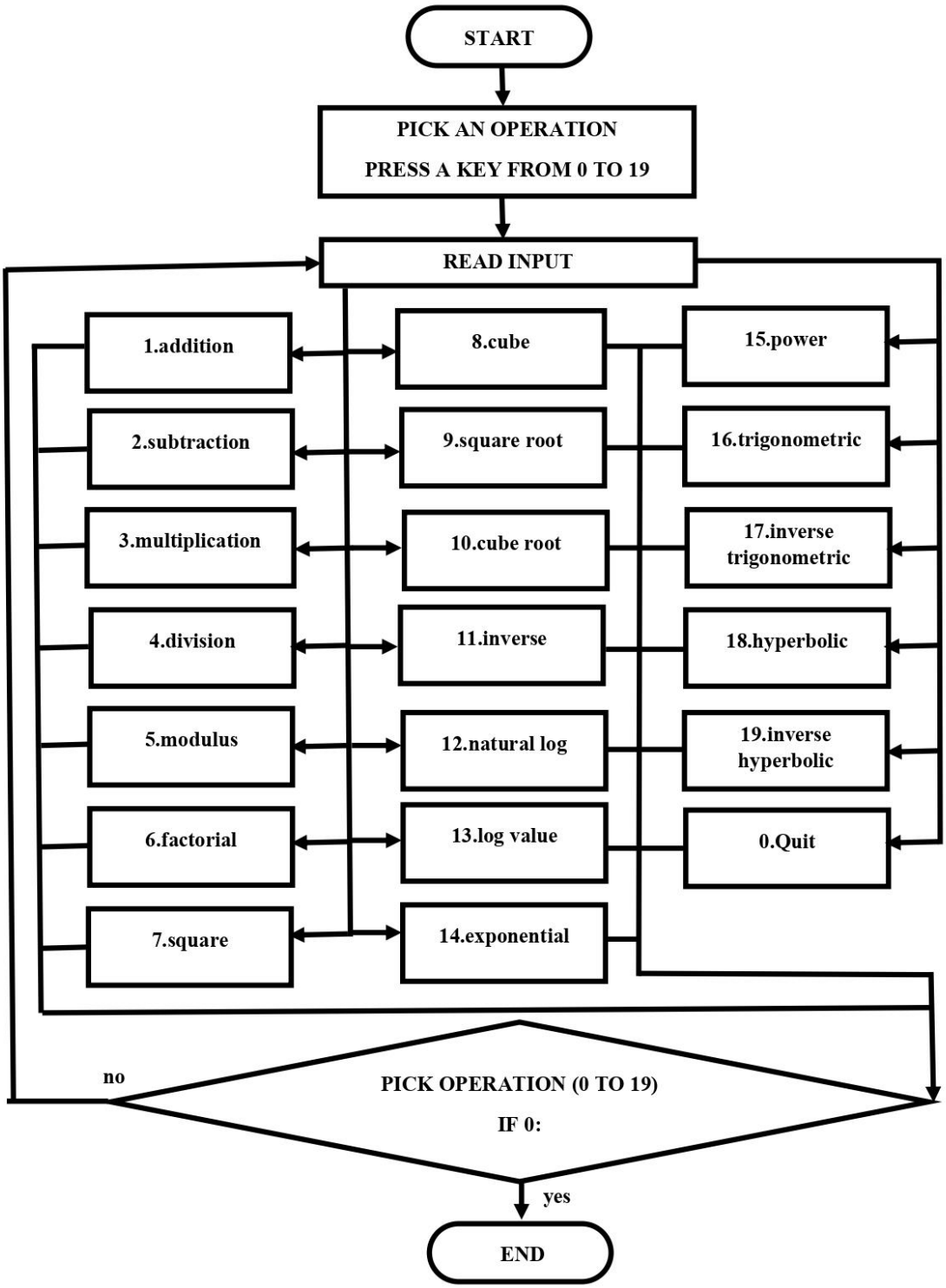
The main objective of this project is to solve basic and advanced mathematical problems. The operations to be performed are addition, subtraction, multiplication, division, modulus, factorial, square, cube, square root, cube root, inverse, natural log, log, exponential, power, trigonometric, inverse trigonometric, hyperbolic, inverse hyperbolic.

Features:

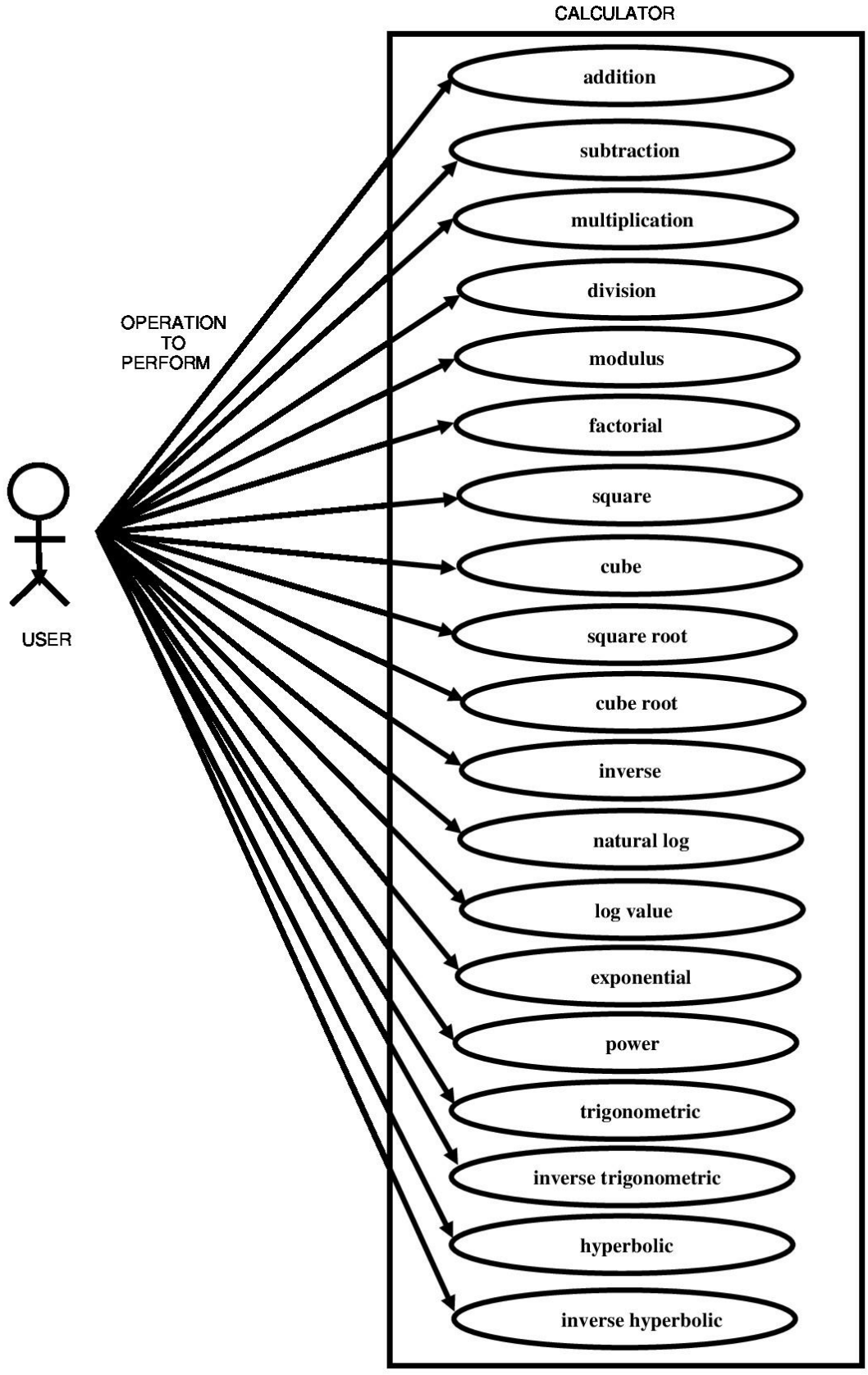
- Addition: The addition add() function takes two operands as input and it results in a+b.
- Subtraction: The subtraction sub() function takes two operands as input and it results in a-b.
- Multiplication: The multiplication multi() function takes two operands as input and it results in a*b.
- Division: The division division() function takes two operand as input and it results in a/b.
- Modulus: The modulus modulus() function takes two operands as input and it results in a%b.
- Factorial: The factorial factorial() function takes one operand as input and it results in a!.
- Square: The square square() function takes one operand as input and it results in a^2.
- Cube: The cube cube() function takes one operand as input and it results in a^3.
- Square root: The square root squareroot() function takes one operand as input and it results in √a.

- Cube root: The cube root cuberoot() function takes one operand as input and it results in $\sqrt[3]{a}$.
- Inverse: The inverse inverse() function takes one operand as input and it results in a^{-1}.
- Natural log: The natural log naturallog() function takes one operand as input and results in ln(a).
- Log value: The log value logvalue() function takes one operand as input and it results in log10(a).
- Exponential: The exponential exponential() function takes one operand as input and it results in exp(a).
- Power: The power power() function takes one operand as input and it results in a^b.
- Trigonometric: The trigonometric trigonometric() function takes one operand as input for each function and results in corresponding sin, cos, tan values.
- Inverse trigonometric: The inverse trigonometric inversetrigonometric() function takes one operand as input for each function and results in corresponding $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$ values.
- Hyperbolic: The hyperbolic hyperbolic() function takes one operand as input for each function and results in corresponding sinh, cosh, tanh values.
- Inverse hyperbolic: The inverse hyperbolic inversehyperbolic() function takes one operand as input for each function and results in corresponding $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$ values.

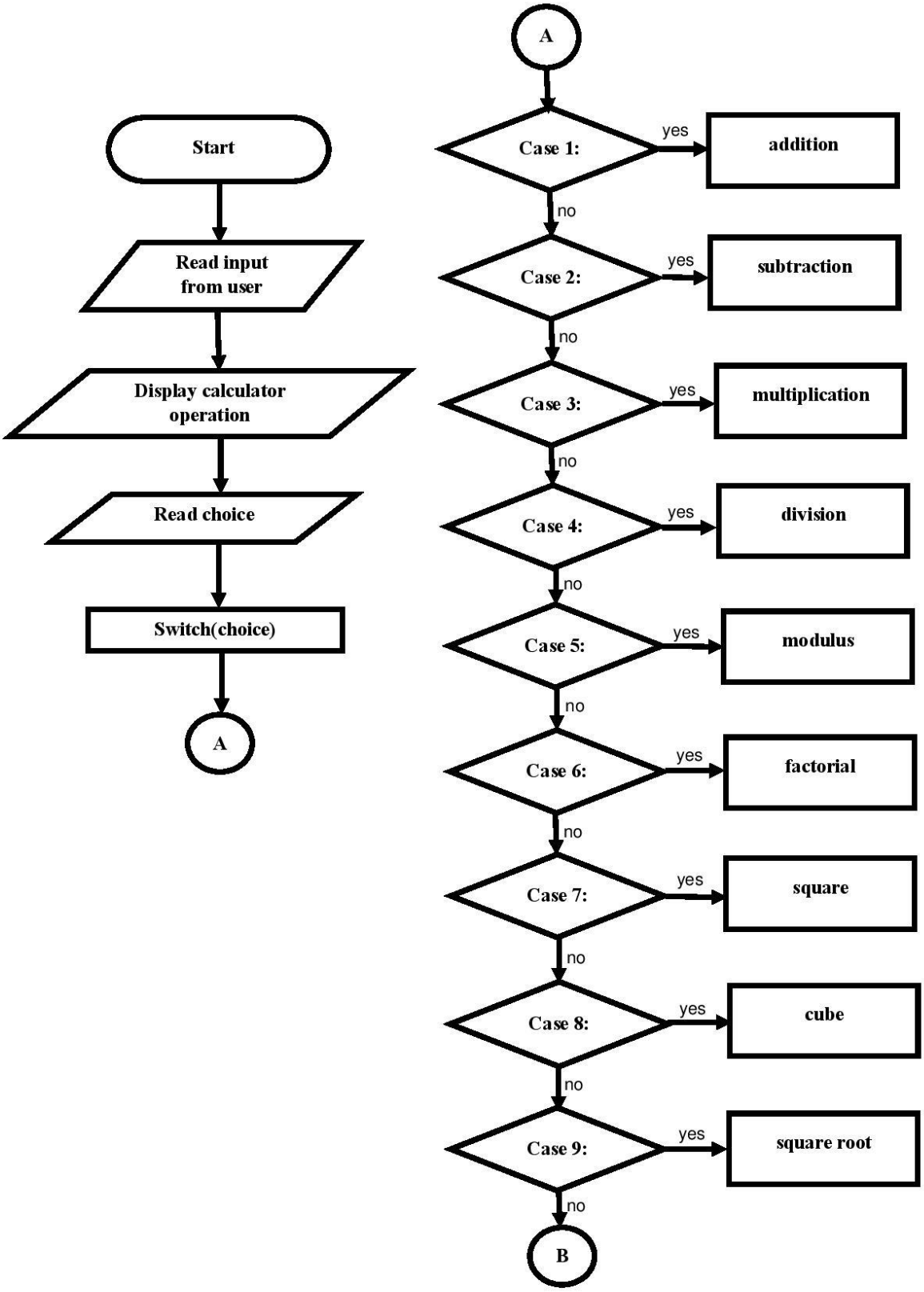
STRUCTURAL DIAGRAM:

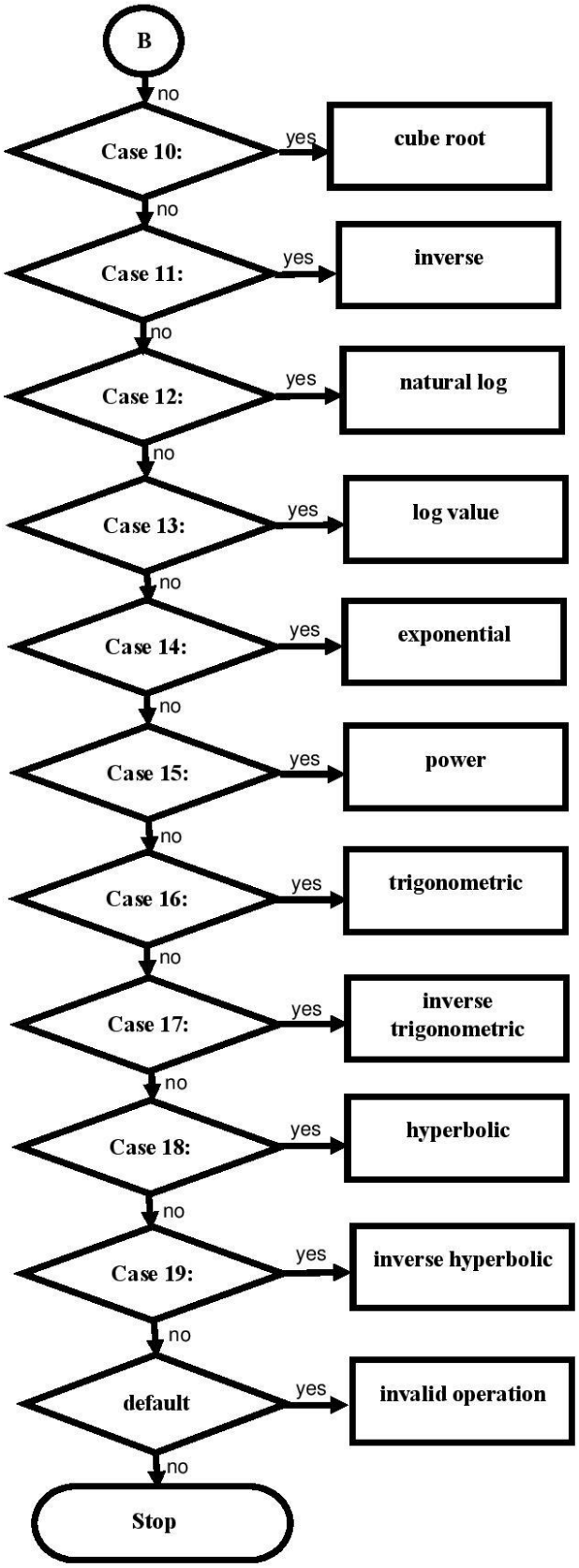


BEHAVIOURAL DIAGRAM:



FLOW CHART:


Start
Read input from user
Display calculator operation
Read choice
Switch(choice)
A
A
Case 1:
yes
addition
no
Case 2:
yes
subtraction
no
Case 3:
yes
multiplication
no
Case 4:
yes
division
no
Case 5:
yes
modulus
no
Case 6:
yes
factorial
no
Case 7:
yes
square
no
Case 8:
yes
cube
no
Case 9:
yes
square root
no
B


B
no
Case 10:
yes
cube root
no
Case 11:
yes
inverse
no
Case 12:
yes
natural log
no
Case 13:
yes
log value
no
Case 14:
yes
exponential
no
Case 15:
yes
power
no
Case 16:
yes
trigonometric
no
Case 17:
yes
inverse trigonometric
no
Case 18:
yes
hyperbolic
no
Case 19:
yes
inverse hyperbolic
no
default
yes
invalid operation
no
Stop

TEST PLAN:

ID	DESCRIPTION	EXPECTED INPUT	EXPECTED OUTPUT	ACTUAL OUTPUT
1	Performing operation '+'	Two numbers (a,b)	SUCCESS	SUCCESS
2	Performing operation '-'	Two numbers (a,b)	SUCCESS	SUCCESS
3	Performing operation '*'	Two numbers (a,b)	SUCCESS	SUCCESS
4	Performing operation '/'	Two numbers (a,b)	SUCCESS	SUCCESS
5	Performing operation '%'	Two numbers (a,b)	SUCCESS	SUCCESS
6	Performing operation '!'	One number (a)	SUCCESS	SUCCESS
7	Performing operation '^2'	One number (a)	SUCCESS	SUCCESS
8	Performing operation '^3'	One number (a)	SUCCESS	SUCCESS
9	Performing operation 'sqrt'	One number (a)	SUCCESS	SUCCESS
10	Performing operation 'cbrt'	One number (a)	SUCCESS	SUCCESS
11	Performing operation '$^{-1}$'	One number (a)	SUCCESS	SUCCESS
12	Performing operation 'log'	One number (a)	SUCCESS	SUCCESS
13	Performing operation 'log10'	One number (a)	SUCCESS	SUCCESS
14	Performing operation 'exp'	One number (a)	SUCCESS	SUCCESS
15	Performing operation 'pow'	Two numbers (a,b)	SUCCESS	SUCCESS
16	Performing operation 'sin, cos, tan'	One number for each function (s, c, t)	SUCCESS	SUCCESS
17	Performing operation '$\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$'	One number for each function (s, c, t)	SUCCESS	SUCCESS
18	Performing operation 'sinh, cosh, tanh'	One number for each function (s, c, t)	SUCCESS	SUCCESS
19	Performing operation '$\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$'	One number for each function (s, c, t)	SUCCESS	SUCCESS

Output:

```
C:\Users\SARANIYAA\Desktop\Calculator>gcc calculator.c

C:\Users\SARANIYAA\Desktop\Calculator>gcc -o calculator calculator.c

C:\Users\SARANIYAA\Desktop\Calculator>calculator
                *****START DOING CALCULATION*****

Enter 0 to quit the program
Enter 1 for Addition
Enter 2 for Subtraction
Enter 3 for Multiplication
Enter 4 for Division
Enter 5 for Modulus
Enter 6 for Factorial
Enter 7 for Square
Enter 8 for Cube
Enter 9 for Squareroot
Enter 10 for Cuberoot
Enter 11 for Inverse
Enter 12 for Naturallog
Enter 13 for Logvalue
Enter 14 for Exponential
Enter 15 for Power
Enter 16 for trigonometric operation
Enter 17 for inverse trigonometric operation
Enter 18 for hyperbolic trigonometric operation
Enter 19 for inverse hyperbolic trigonometric operation


Enter the operation you want to do: 1
Enter the two numbers you want to add: 25 40
The sum of 25.000000 and 40.000000 is 65.000000
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Enter the operation you want to do: 2
Enter the first and second number you want to subtract: 45 2
The difference between 45.000000 and 2.000000 is 43.000000


Enter the operation you want to do: 3
Enter the two numbers you want to multiply: 30 2
The product of 30.000000 and 2.000000 is 60.000000


Enter the operation you want to do: 4
Enter the dividend and divisor to perform division: 15 2
15.000000 / 2.000000 is 7.500000


Enter the operation you want to do: 5
Enter the dividend and divisor to perform modulus: 17 4
The modulus of 17 and 4 is 1


Enter the operation you want to do: 6
Enter the number to find factorial: 5

Factorial of 5 is 120

Enter the operation you want to do: 7
Enter the number to find square: 6
The square of 6.000000 is 36.000000

Enter the operation you want to do: 8
Enter the number to find cube : 7
The cube of 7.000000 is 343.000000

Enter the operation you want to do: 9
Enter the number to find square root: 625
The square root of 625.000000 is 25.000000

Enter the operation you want to do: 10
Enter the number to find cube root: 125
The cube root of 125.000000 is 5.000000
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Enter the operation you want to do: 11
Enter the number to find inverse: 1000
The inverse of 1000.000000 is 0.001000

Enter the operation you want to do: 12
Enter the number to find naturallog: 5
The natural log of 5.000000 is 1.609438

Enter the operation you want to do: 13
Enter the number to find log values: 10
The log to the base 10 of 10.000000 is 1.000000

Enter the operation you want to do: 14
Enter the number to find exponential value: 1
The e^ 1.000000 is 2.718282

Enter the operation you want to do: 15
Enter the base value: 3
Enter the exponent value: 4
3.000000 ^ 4.000000 is 81.000000

Enter the operation you want to do: 16
Range of sine function is from -90 t0 90
Enter angle in degree for sine function: 30
Range of cosine function is from 0 t0 180
Enter angle in degree for cosine function: 30
Range of tangent function is -90 t0 90
Enter angle in degree for tangent function: 30
sin(30.000000) = 0.500000
cos(30.000000) = 0.866026
tan(30.000000) = 0.577350


Enter the operation you want to do: 17
Range of sine function is from -1 to 1
Enter value to find sine inverse: 0
Range of cosine function is from -1 to 1
Enter value to find cosine inverse: 0
Range of tangent function is all real
Enter value to find tan inverse: 0
sininv(0.000000) = 0.000000
cosinv(0.000000) = 90.000076
taninv(0.000000) = 0.000000
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```
Enter the operation you want to do: 18
Range of hyperbolic sine function is from -inf to inf
Enter value to find hyperbolic sine: 0
Range of hyperbolic cosine function is from 1 to inf
Enter value to find hyperbolic cosine: 2
Range of hyperbolic tangent function is from -1 to 1
Enter value to find hyperbolic tan: 0
sinh(0.000000) = 0.000000
cosh(2.000000) = 3.762196
tanh(0.000000) = 0.000000


Enter the operation you want to do: 19
Range of hyperbolic sine  function is from -inf to inf
Enter value to find hyperbolic sine inverse: 0
Range of hyperbolic cosine function is from 1 to inf
Enter value to find hyperbolic cosine inverse: 2
Range of hyperbolic tangent function is from -1 to 1
Enter value to find hyperbolic tan inverse: 0
sinhinv(0.000000) = -0.000000
coshinv(2.000000) = 1.316958
tanhinv(0.000000) = 0.000000


Enter the operation you want to do: 0

C:\Users\SARANIYAA\Desktop\Calculator>
```