Name: Kareem mohamed shawki
sec: 2
group: 7
ID: 2101071

Function 1

given: I got scholarship, and I got an "A" in math. I'm not good at logic or I got an "A" in math. Therfore, I'm good at logic or I don't get a scholaship

Breaking Down the statment

1_ propositions:

- n1: "I got a scholarship"
- n2 = "I got 'A' in math"
- n3 = "I'm good at logic"

2_ logical Transition:

- premises:
  - p1 = n1 ^ n2 → " I got a scholarship, and I got "A" in math"
  - p2 = !n3 ∨ n2 → " I'm not good at logic or I got an 'A' in math"
- Calculation:
  - C = n3 ∨ !n1 → " I'm good at logic or I don't get a scholarship

→ step1: Truth Table

n1	n2	n3	p1: n1 ^ n2	p2: !n3 ∨ n2	C: n3 ∨ !n1
0	0	0	0	1	1
0	0	1	0	1	1
0	1	0	0	1	1
0	1	1	0	1	1
1	0	0	0	1	0
1	0	1	0	1	1
1	1	0	1	1	0
1	1	1	1	1	1

* steps to Create C++ function to implement This code :-

1_ Calculate Rows: Total rows or $2^{\text{Variable \#}}$ (all possible Combinations of 0 and 1)

2_ Resize The Table: Create 2D vector with rows and numVars (# of Variables) Colums

3_ Generate Truth Values:

- loop through each row and Variable
- uses bitwise shifting to extract the binary Values (0 or 1) for each Variable in Current row by this rule:

truthTable[i][j] = (i >> (numVars - j - 1)) & 1;

4_ output: A 2D Table where each row represents a unique Combination of truth Values (0 or 1)

→ step2: Analyze Premises & Calculation

steps Create C++ function to evaluate expressions:

- This is a function it takes the row and expression and apply the expression and recurn The result in (0 or 1), I need This to evaluate expressions in each row for the premises and Calculation to implement full truth table and to Check for satisfiablity and Validity in the next steps.

→ Step 3: evaluate Truth table to check satisfiability and validity :-

Satisfiability: AT least one assignment of truth values that make all premisi's and The Calculation true

- in our example The Row(n1=1, n2=1, n3=1) → all are true so satisfiable ✓✓

Steps in Validity: an argument is valide if, whenever the premises are true, the calculation is also true

- in our example The Row(n1=1, n2=1, n3=0): premisis are true, but calculation are false so it's not Valid ✓✓

→ Conclusion:- in This statment: satisifable but Falsiable

steps to Create C++ function to evaluate satisfiability and Validity

1- function take The implemented Truth Table and premisis1 and premisis2 and Calculation

2- evaluate all values for premsis1 and prensis2 and calculation

3- check for each row if (p1^p2^C)=1, then satisfiable, else not satisifiable

4- check for each row if (p1^p2^!C)=1, then falsiable, else Valide

5- print result

finally test all functions on Main to make sure that the hand written results is equivilant to The Programa results ✓✓