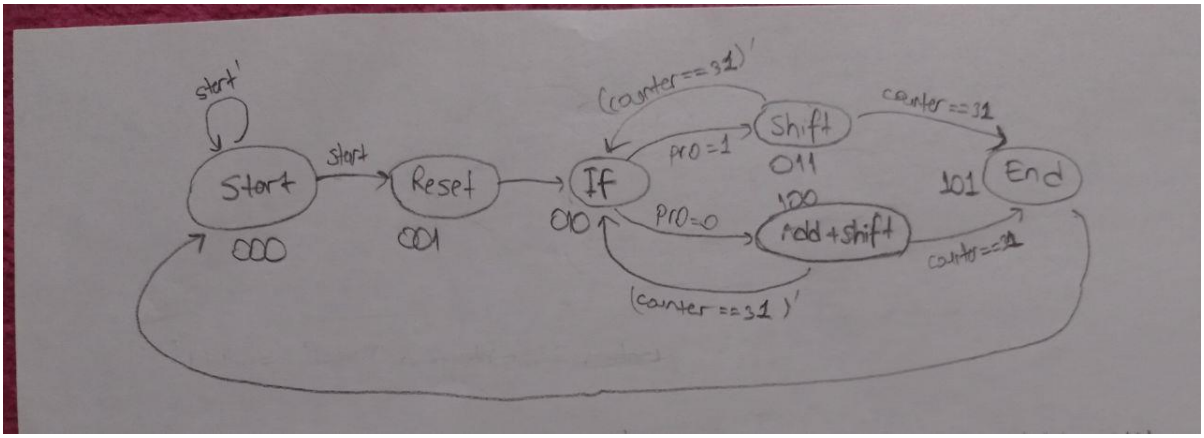
HARUN ALBAYRAK – Homework #3 Report
171044014
CSE 331

FSM of the control unit :



S2	S1	S0	PR0	C==31	Start	-	LP	LMC	SP	SM	IC	N2	N1	N0
0	0	0	X	X	0	-	0	0	0	0	0	0	0	0
0	0	0	X	X	1	-	0	0	0	0	0	0	0	1
0	0	1	X	X	X	-	1	1	0	0	0	0	1	0
0	1	0	0	X	X	-	0	0	0	0	0	1	0	0
0	1	0	1	X	X	-	0	0	0	0	0	0	1	1
0	1	1	X	0	X	-	1	0	1	0	1	0	1	0
0	1	1	X	1	X	-	1	0	1	0	1	1	0	1
1	0	0	X	0	X	-	1	0	1	1	1	0	1	0
1	0	0	X	1	X	-	1	0	1	1	1	1	0	1
1	0	1	X	X	X	-	0	0	0	0	0	0	0	0

Inputs = S2,S1,S0 (States), PR0 (Product0), C==31, Start

Outputs = LP (Load of product register)

LMC (Load of multiplicand register and counter)

SP (Select bit of product register)

SM (Select of the 3rd mux)

IC (Increment counter)

LP = S2'S0 + S2S1'S0'

LMC = S2'S1'S0

SP,IC = S2'S1S0 + S2S1'S0'

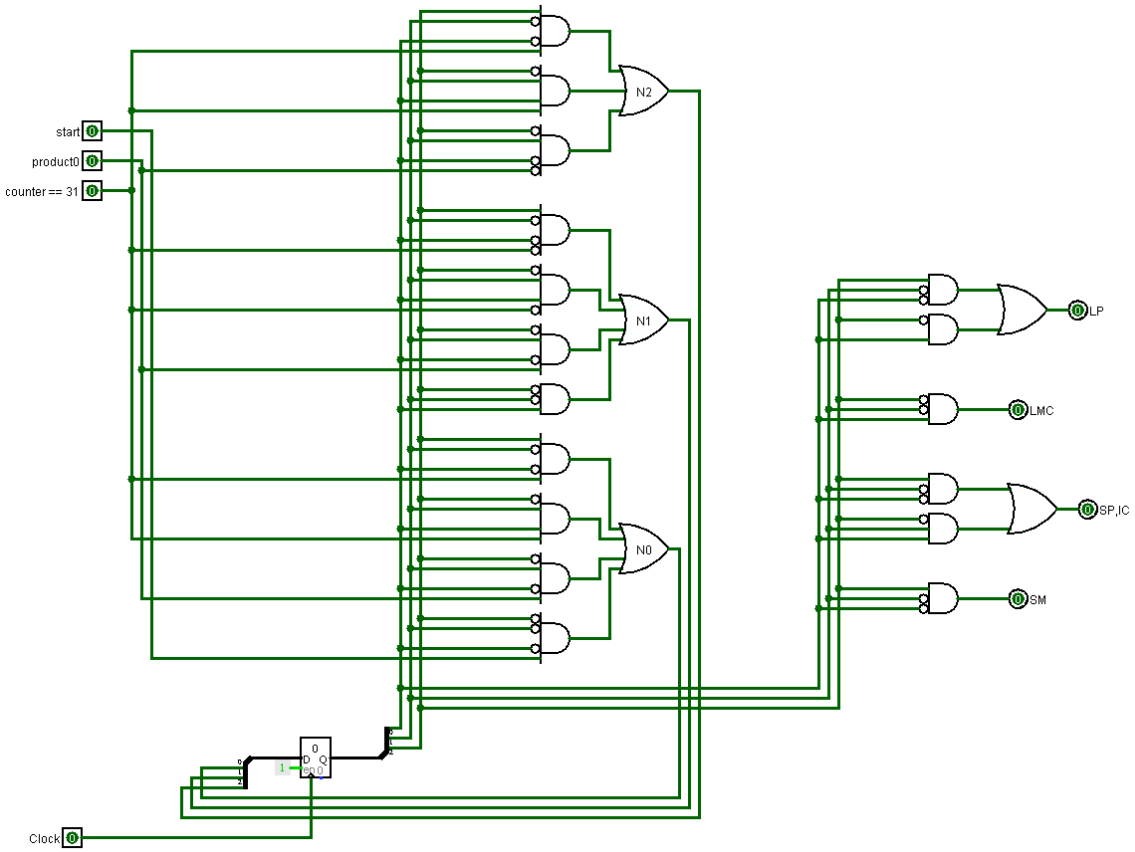
SM = S2S1'S0'

N2 = S2'S1S0'(PR0)' + S2'S1S0(C==31) + S2S1'S0'(C==31)

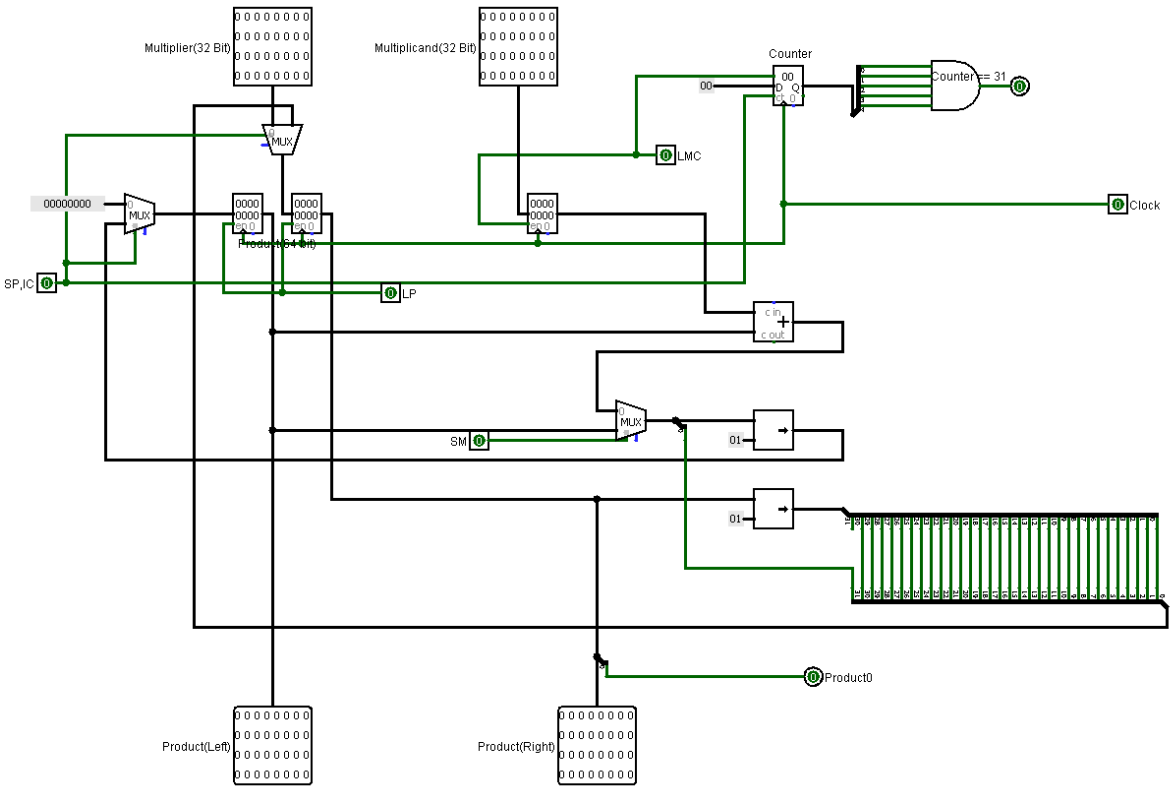
N1 = S2'S1'S0 + S2'S1S0'(PR0) + S2'S1S0(C==31)' + S2S1'S0'(C==31)'

N0 = S2'S1'S0'(START) + S2'S1S0'(PR0) + S2'S1S0(C==31) + S2S1'S0'(C==31)

Control Unit :



Datapath :

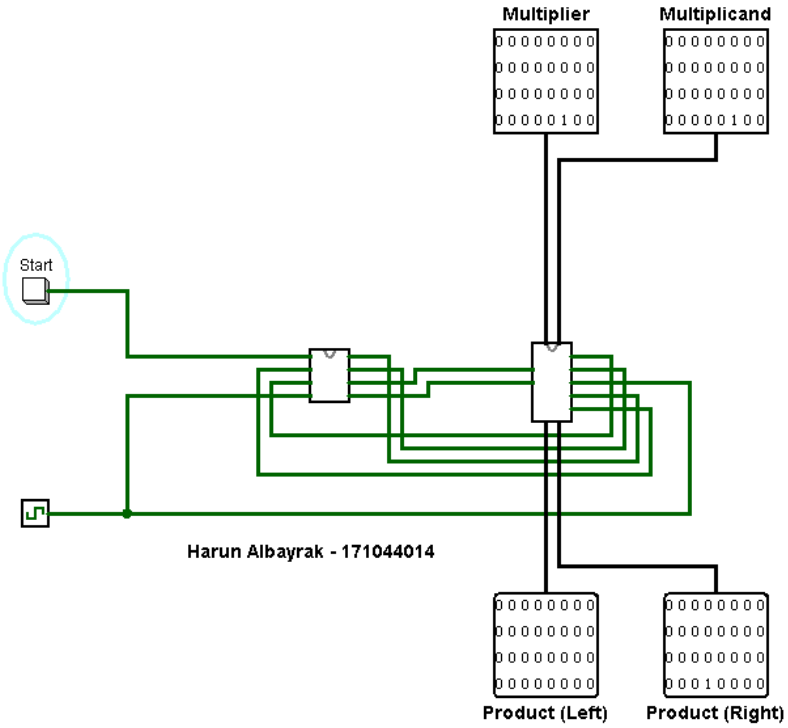


You should press the start button after you enter the multiplier and multiplicand

Test Cases :

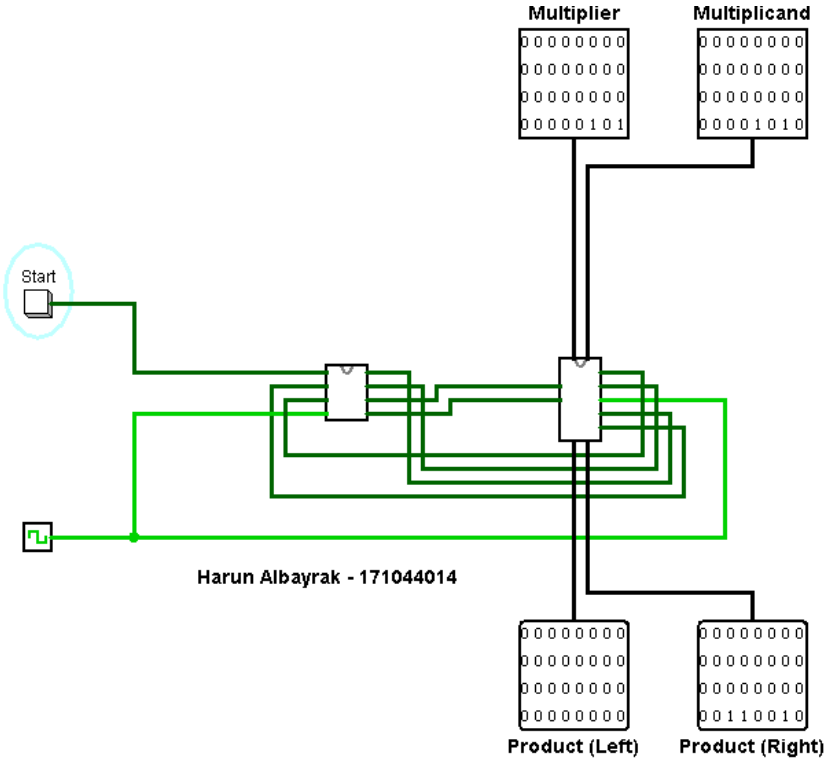
1) 4 x 4 = 16

0100 x 0100 = 10000



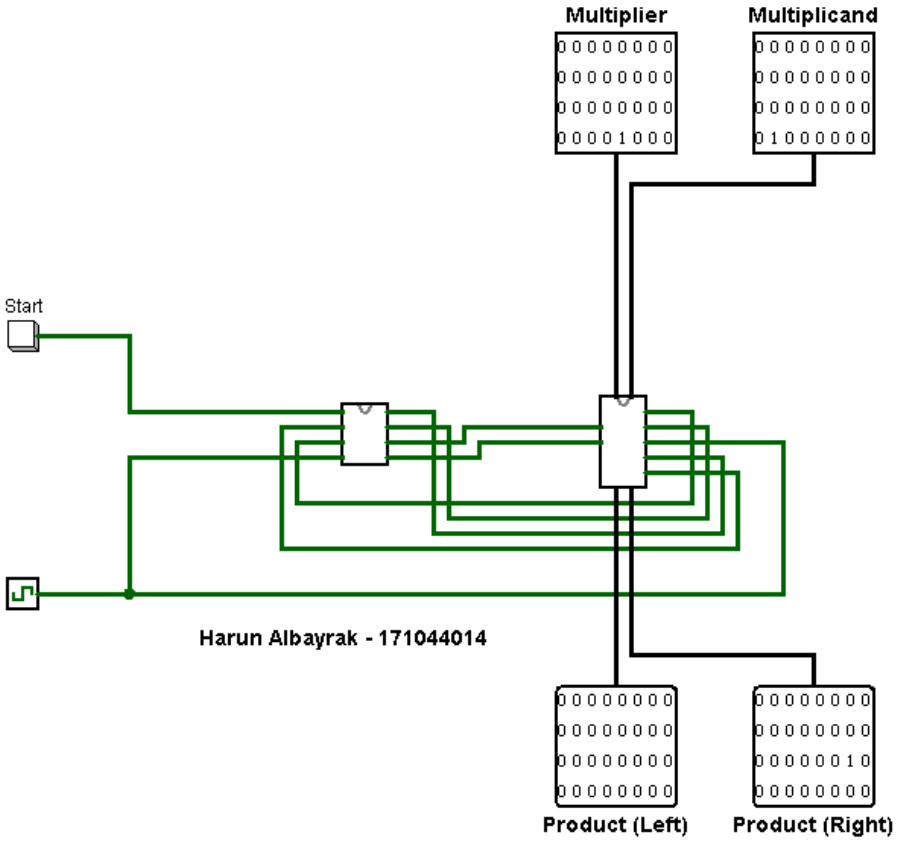
2) 5 x 10 = 50

0101 x 1010 = 110010



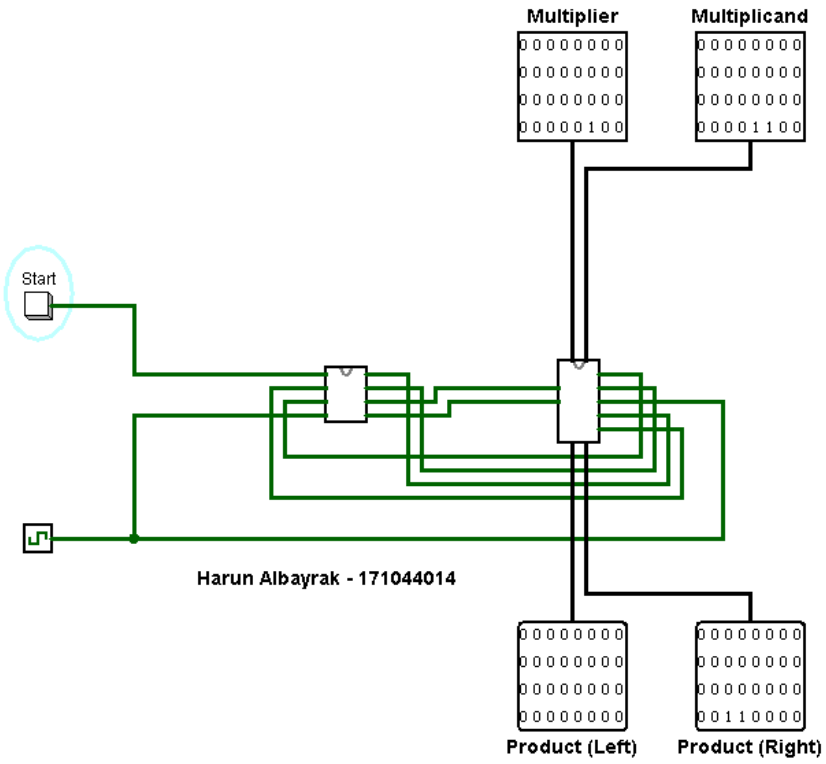
3) 8 x 64 = 512

1000 x 1000000 = 1000000000



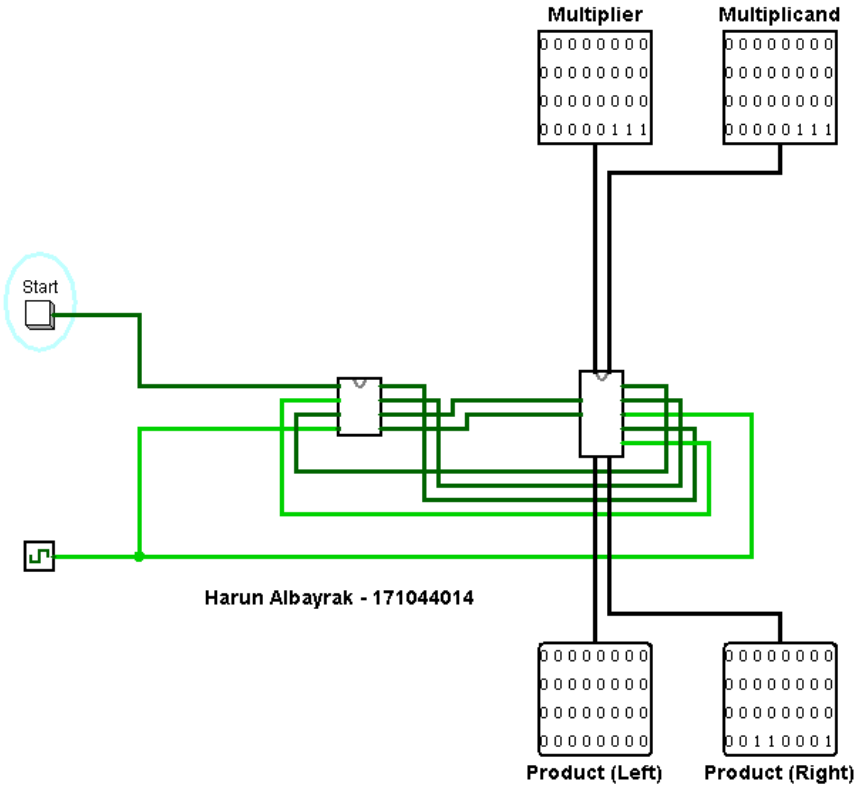
4) 4 x 12 = 48

0100 x 1100 = 110000



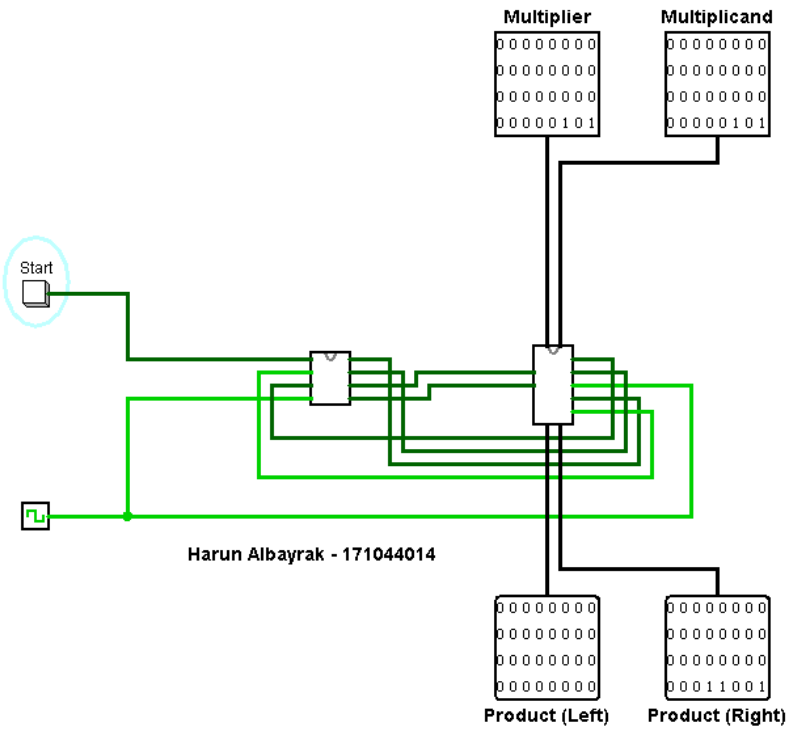
5) 7 x 7 = 49

0111 x 0111 = 110001



6) 5 x 5 = 25

0101 x 0101 = 11001



7) 9 x 9 = 81

1001 x 1001 = 1010001