A sequential circuit has one flip-flop, two inputs, X and Y, and one output D. It consists of a full-subtractor circuit connected to a JK flip-flop, as shown. Fill in the truth table for this sequential circuit by completing the Next State and Output columns.

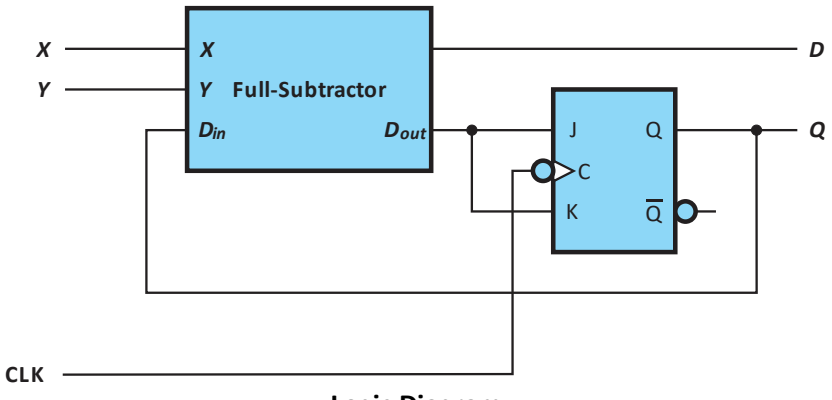
Inputs			Outputs	
X	Y	B_{in}	D	B_{out}
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

Truth table for full-subtractor

X: Minuend, Y: Subtrahend, D: Difference, B_{in}:Borrow-in, B_{out}: Borrow-out

Present State	Inputs		Next State	Output
$Q(t)$	X	Y	$Q(t+1)$	D
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Next State Table to Complete



Logic Diagram

Present State $Q(t)$	Inputs X	Y	Next State $Q(t+1)$	Output D
0	0	0	0	0
0	0	1	1	1
0	1	0	0	1
0	1	1	0	0
1	0	0	1	1
1	0	1	1	0
1	1	0	0	0
1	1	1	1	1

Next State Table

Solution

$$B_{in} = Q(t), B_{out} = D$$

Inputs X	Y	B_{in}	Outputs D	B_{out}
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1