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Course: CSE 231L

Section: 8

Final

Answer to the Question no. - 1

Subtracting 1010 from 1100 using 2's complement,

$$\begin{array}{r} 1010 \\ 1's \text{ complement } 0101 \\ + 1 \\ \hline 2's \text{ complement } 0110 \end{array}$$

$$\begin{array}{r} 1100 \\ + 0110 \\ \hline 10010 \end{array}$$

So, subtracting 1010 from 1100 using 2's complement we get 10010 where the left most bit is the carry out.

Now, explaining using a XOR truth table how data input B is subtracted from A for the value $M=1$ in the given figure.

M	B	X
0	0	0
0	1	1
1	0	1
1	1	0

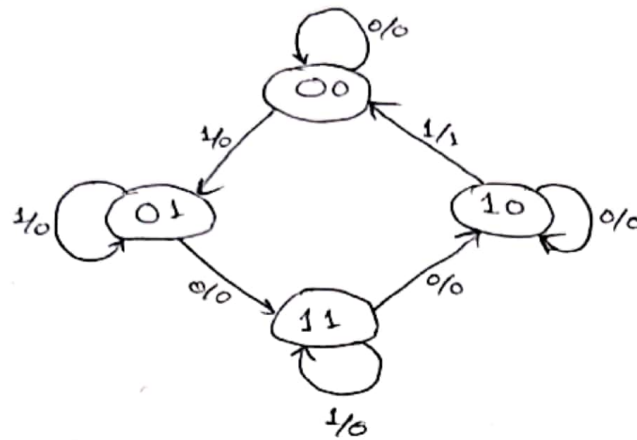
The given circuit is an adder-subtractor circuit where for the value $M=0$ it works,

like an adder and for $M=1$ it works like a subtractor.

And that's because when M is 0 we get the output same as the input B thus the circuit adds A and B .

But while subtracting we need to do a 1's complement and an extra 1 from 2's complement.

From the XOR table, we can see that when $M=1$ the output is the opposite of B thus working like 1's complement and then that extra 1 from carry in as $M=1$ does the work of 2's complement thus making the circuit work like a subtractor.

Answer to the Question no - 2

Present State		Input	Next State		Output	Flip-Flop input functions			
A	B	X	A	B	Y	J _A	K _A	J _B	K _B
0	0	0	0	0	0	0	X	0	X
0	0	1	0	1	0	0	X	1	X
0	1	0	1	1	0	1	X	X	0
0	1	1	0	1	0	0	X	X	0
1	0	0	1	0	0	X	0	0	X
1	0	1	0	0	1	X	1	0	X
1	1	0	1	0	0	X	0	X	1
1	1	1	1	1	0	X	0	X	0

Excitation Table of

Q(t)	Q(t+1)	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

K-Maps:For J_A ,

0	0	0	1
X	X	X	X

$$\therefore J_A = B\bar{X}$$

For J_B ,

0	1	X	X
0	0	X	X

$$\therefore J_B = \bar{A}X$$

For Y ,

0	0	0	0
0	1	0	0

$$\therefore Y = A\bar{B}X$$

For K_A

X	X	X	X
0	1	0	0

$$\therefore K_A = \bar{B}X$$

For K_B ,

X	X	0	0
X	X	0	1

$$\therefore K_B = AX$$

We would need 1 7476

IC of JK FF and 1

AND IC and 1 7411

AND IC - to physically implement the circuit-

