

18

26/11/20

Question 1

(a) The difference between latch and flip-flops is that a latch is level-triggered (outputs can change as soon as the input changes) while flip-flops is edge triggered (only changes state when a control signal goes from high to low or low to high).

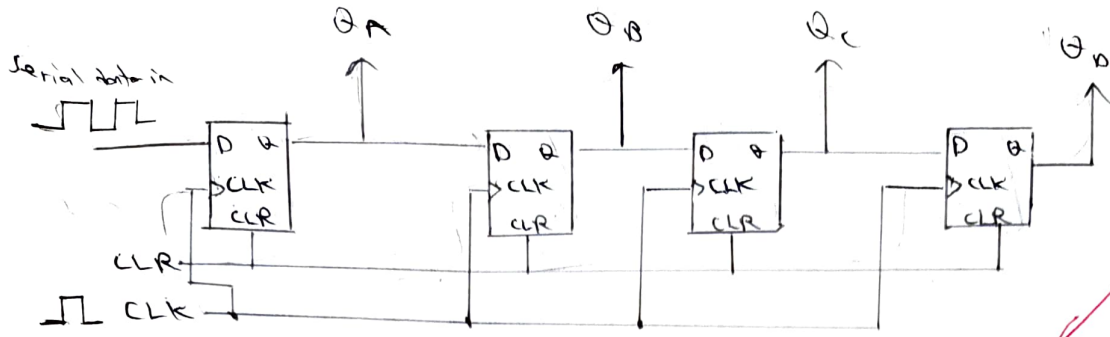
- Explain about latches and flip-flops

(b) The master-slave are alternatives flip-flop design by using Gated SR latch (level-triggered). Data is entered into flip-flop at the leading edge of the clock pulse, the output is reflected at the trailing edge. Master slave don't allow data to change while clock pulse is active. Any changes in S and R inputs change the master outputs, but cannot affect the slave, Q. When the pulse returns to 0, the master is disabled and is isolated from the S and R inputs. At the same time, the slave is enabled, and the current value of Q is transferred to output of flip-flop at Q. When $C=0$, the output of inverter is 1, the slave latch is enabled, and its output, Q is equal to master input, 1. The master latch is disabled because $C=0$. When $C=1$, the values of S and R control the stored value in the master latch, 1. The slave at this time is disabled because C input is 0.

- Draw diagram

4/2

(c)

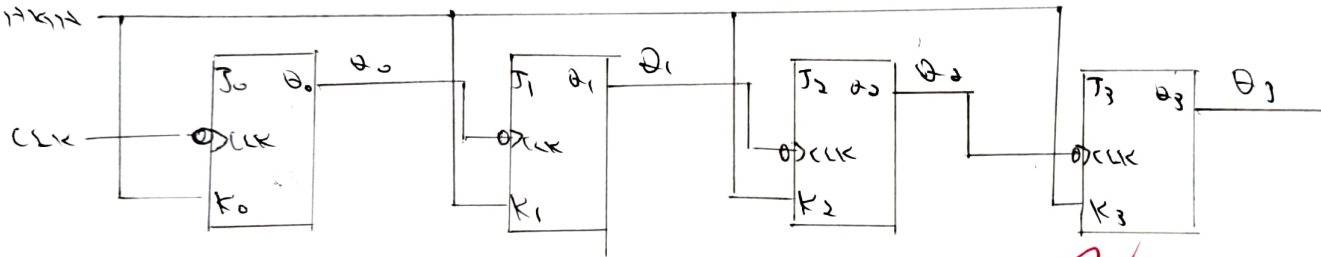


Draw all 5150, P10, 5150, P10

(d) Answer in appendix

Question 2

(a)



CLK	Q ₀	Q ₁	Q ₂	Q ₃
↓	0	0	0	0
↓	0	0	1	0
↓	0	1	1	0
↓	1	0	1	0

0000
1010
1011

MSB LSB



(b)

Q ₂	Q ₁	Q ₀	X
0	0	0	0
0	0	0	0
0	0	1	0
0	1	1	0
1	0	1	0

CLK	Q ₂	Q ₁	Q ₀
↑	0	0	0
↑	1	0	0
↑	1	1	0
↑	1	1	1

D₀ = 0102
P₁ = 00
Q₂ = 01

Question 3

a) $D_a = Xa + YB$

$D_b = (X + \bar{A})(\bar{X})$
 $= \bar{X}B$

~~$Y = (A + B)(\bar{X})$~~

$b_a = X(A + B)$

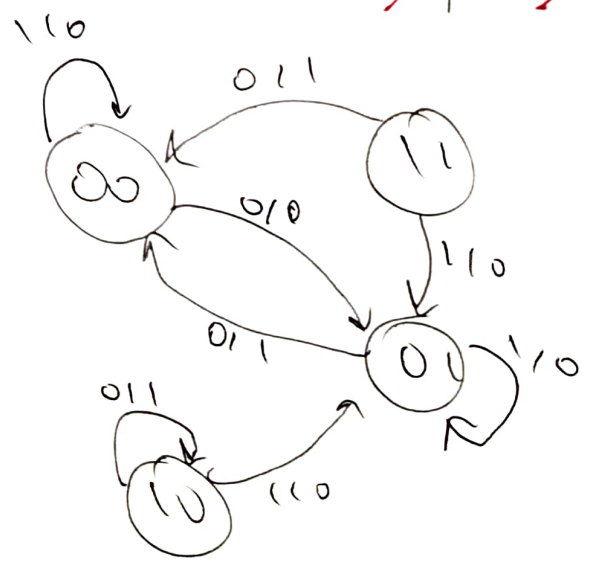
$b_b = \bar{X}A$

$Y = (A + B)\bar{X}$

3

Present State		Next State				Y	
B	A	x=0		x=1		x=0	x=1
		A+	A+	A+	A+		
0	0	1	0	0	0	0	0
0	1	0	0	0	1	1	0
1	0	0	1	0	1	1	0
1	1	0	0	1	1	1	0

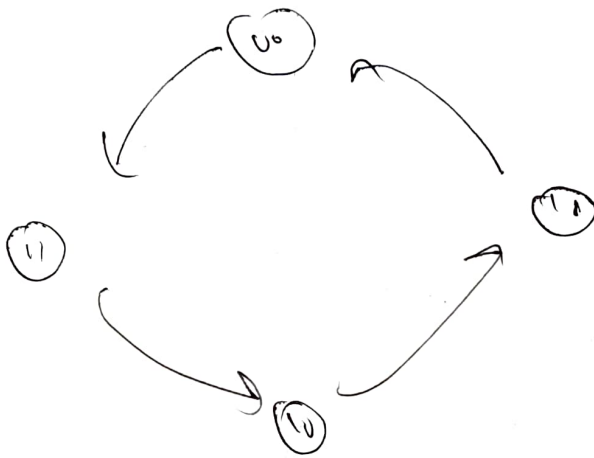
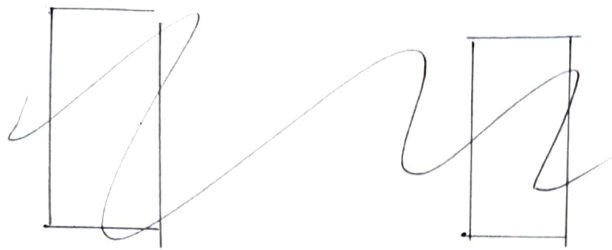
(b)



2/6

6/6

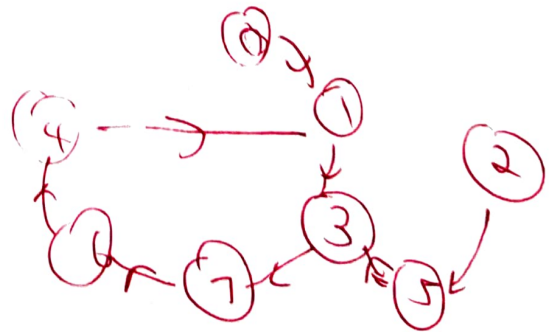
(b)



2(b)

Present state			Next state		
Q_2	Q_1	Q_0	Q_2^+	Q_1^+	Q_0^+
0	0	0	0	0	1
0	0	1	0	1	1
0	1	0	1	0	1
0	1	1	1	1	0

$$Q_0 \Rightarrow Q_0 = \frac{0 \cdot 0}{1} = 1$$



SULIT

1 - shift
0 - load

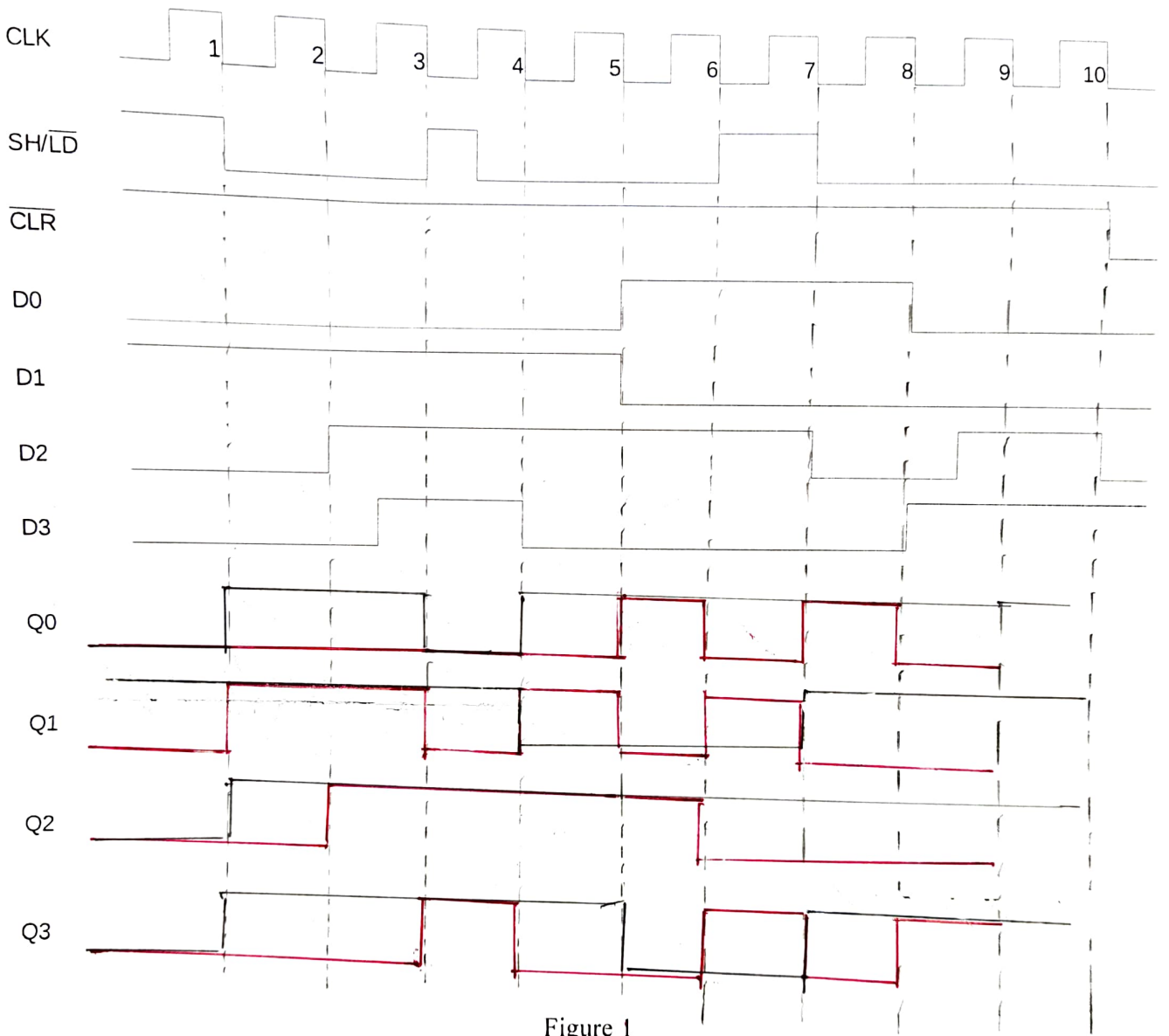


Figure 1