XNOR $= Q_B Q_C + \bar{Q}_B \bar{Q}_C$

Q1

Q_A	Q_B	Q_C	$Q_A^+(D_A) = (Q_B \oplus Q_C)$	$Q_B^+(D_B) = Q_A$	$Q_C^+(D_C) = Q_B$
0	0	0	1	0	0
1	0	0	1	1	0
1	1	0	0	1	1
0	1	1	1	0	1
1	0	1	0	1	0
0	1	0	0	0	1
0	0	1	0	0	0

Q2

Q_0	Q_1	Q_2	$Q_0^+(D_0) = \bar{Q}_2$	$Q_1^+(D_1) = \bar{Q}_0$	$Q_2^+(D_2) = Q_0 \bar{Q}_1$
0	1	0	1	1	0
1	1	0	1	0	0
1	0	0	1	0	1
1	0	1	0	0	1
0	0	1	0	1	0
0	1	0	1	1	0

$Q_2 Q_1 Q_0$: 010, 100, 011, 101

Q3

CLK	Q_3	Q_2	Q_1	Q_0	$Q_3^+ = Q_2 \oplus Q_1$	Q_2^+	Q_1^+	Q_0^+
1	0	1	1	0	1	0	1	1
2	1	0	1	1	0	1	0	1
3	0	1	0	1	1	0	1	0

Q4 (a)

CLK	Q_0	Q_1	Q_2	Q_3
0		0	0	0
1	1		0	0
→ 2			1	0
3	0	1	1	1
4	0	0	1	1
5	0	0	0	1
6	1	0	0	0

(b) After 1st CLK

$D = 1, Q_0 = 0, Q_1 = 0, Q_2 = 1$

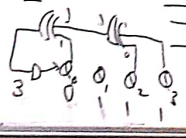
$D = (Q_2 \oplus Q_3) \oplus Q_0$

$1 = (1 \oplus Q_3) \oplus 0$

$1 = Q_3 \oplus 1$

$Q_3 = 0$

$\bar{Q}_0 Q_1 + Q_0 \bar{Q}_1$



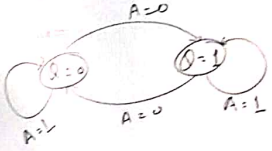
Q5

	D_A	S_A	D_B	S_B	D_C	S_C	S	Cout	Cin	SR
NOCLK	1	0	1	0	0	0	0	0	0	10 11 00 01 11
1 CLK	1	1	1	1	1	1	0	1	1	- 1 0 1 - 0 0 1
2 CLK	0	0	0	0	0	0	1	0	0	- - 1 0 - - 0 0

S = 1, Cout = 0

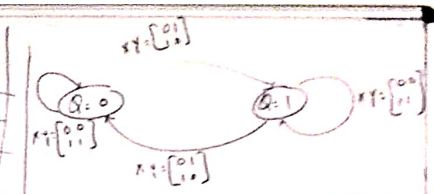
Q6 A = 0, Y = X_0, $\bar{Q} = D \Rightarrow Q^+ = \bar{Q}$

A = 1, Y = X_1, $Q = D \Rightarrow Q^+ = Q$



Q7 $D = A \oplus X \oplus Y$

X	Y	Q	D	Q^+
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1



Q8 $D_1 = Q_2$, $D_2 = A \oplus S = Q_1 \oplus S$

Q_2	Q_1	S	$Q_2^+ = D_2$	$Q_1^+ = D_1$
0	0	0	0	0
0	0	1	0	1
0	1	0	1	0
0	1	1	1	1
1	0	0	0	1
1	0	1	0	0
1	1	0	1	1
1	1	1	1	0

$D = A \odot S = AS + \bar{A}\bar{S}$

if $A = \bar{Q}_1$

$D_2 = \bar{Q}_1 S + Q_1 \bar{S}$

Input A should be connected to $\bar{Q}_1$

Ans = option D