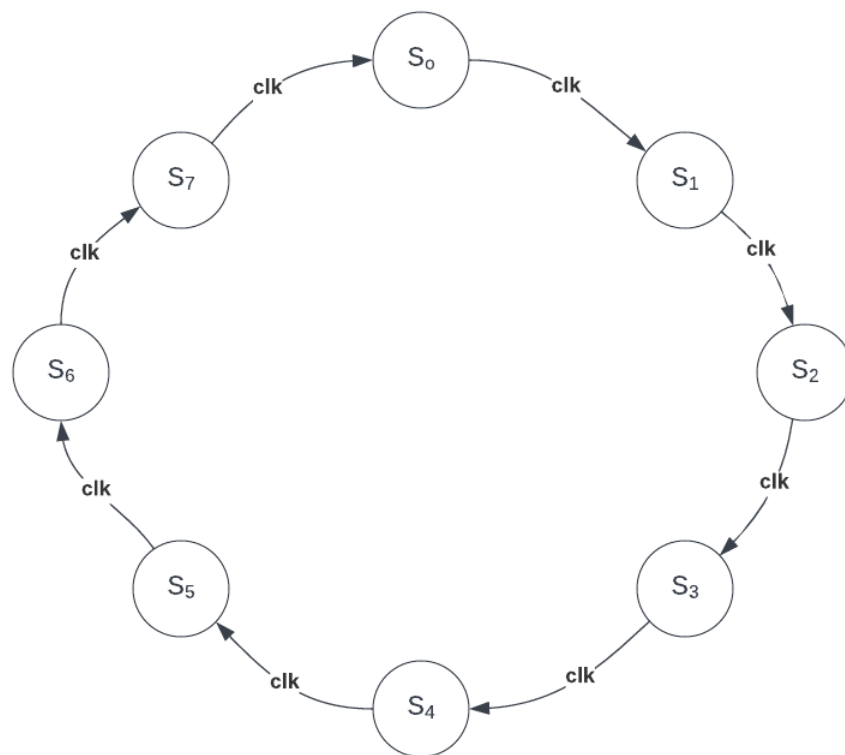


Question#1 3-bit gray code counter

a) I) State Assignment

STATE	GRAY CODE
S_0	000
S_1	001
S_2	011
S_3	010
S_4	110
S_5	111
S_6	101
S_7	100

II) State diagram



III) State table

Present state	(Next state, output)
S_0	$(S_1, 0)$
S_1	$(S_2, 0)$
S_2	$(S_3, 0)$
S_3	$(S_4, 0)$
S_4	$(S_5, 0)$
S_5	$(S_6, 0)$
S_6	$(S_7, 0)$
S_7	$(S_0, 1)$

IV) Transition and output table

Present state	Next state	Output
S_0	S_1	0
S_1	S_2	0
S_2	S_3	0
S_3	S_4	0
S_4	S_5	0
S_5	S_6	0
S_6	S_7	0
S_7	S_0	1

V) Excitation table

Present state			Next state			D F/F inputs			Output
Q(2)	Q(1)	Q(0)	Q(2)	Q(1)	Q(1)	D(2)	D(1)	D(0)	Out
0	0	0	0	0	1	0	0	1	0
0	0	1	0	1	1	0	1	1	0
0	1	1	0	1	0	0	1	0	0
0	1	0	1	1	0	1	1	0	0
1	1	0	1	1	1	1	1	1	0
1	1	1	1	0	1	1	0	1	0
1	0	1	1	0	0	1	0	0	0
1	0	0	0	0	0	0	0	0	1

b) Kmap:

Q ₂ \ Q ₁ Q ₀		00		01		11		10	
		0	1	0	1	0	1	0	1
0		0		0		0		1	
1		0		1		1		1	

$$D(2) = Q_2 Q_0 + Q_1 \sim Q_0$$

Q ₂ \ Q ₁ Q ₀		00		01		11		10	
		0	1	0	1	0	1	0	1
0		0		1		1		1	
1		0		0		0		1	

$$D(1) = \sim Q_2 Q_0 + Q_1 \sim Q_0$$

Q ₂ \ Q ₁ Q ₀		00		01		11		10	
		1	0	1	0	0	1	0	1
0		1		1		0		0	
1		0		0		1		1	

$$D(0) = Q_2 Q_1 + \sim Q_2 \sim Q_1$$

Circuit Diagram:

