

Homework 6

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| S_n | S_{n+1} |
|-------|-----------|
| S_0 | S_1 |
| S_1 | S_2 |
| S_2 | S_0 |
| S_3 | S_3 |

| n | $n+1$ |
|-------|-----------|
| Q_n | Q_{n+1} |
| 0 | 0 |
| 0 | 1 |
| 1 | 1 |
| 1 | 0 |

| Q_n | Q_{n+1} | J_1 | K_1 | J_0 | K_0 |
|-------|-----------|--------|--------|--------|--------|
| 0 | 0 | 0 | ϕ | 1 | ϕ |
| 0 | 1 | 1 | ϕ | ϕ | 0 |
| 1 | 1 | ϕ | 1 | ϕ | 1 |
| 1 | 0 | ϕ | 0 | 0 | ϕ |

$$J_1 = Q_1 + Q_0$$

$$K_1 = \overline{Q_1} + Q_0$$

$$J_0 = K_1$$

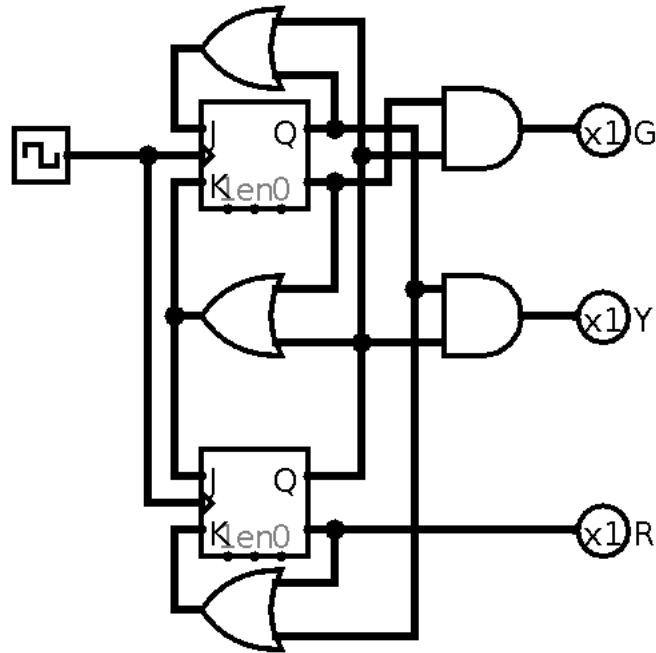
$$K_0 = Q_1 + \overline{Q_0}$$

| Q_n | Q_{n+1} | G | Y | R |
|-------|-----------|-----|-----|-----|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |

$$G = \overline{Q_1}Q_0$$

$$Y = Q_1Q_0$$

$$R = \overline{Q_0}$$



Python simulation:

```
Q1 = 1
Q0 = 0

def NOT( a ):
    return 1 - a

for step in range( 20 ):

    J1 = Q1 | Q0
    K1 = NOT(Q1) + Q0
    J0 = K1
    K0 = Q1 + NOT(Q0)
    G = Q1 & Q0
    Y = NOT(Q1) & Q0
    R = NOT(Q0)

    print( "Q1_Q0=%d_%d | G_Y_R=%d_%d_%d" %
           ( Q1, Q0, G, Y, R ) )
    input( ">" )

    if(J1 ^ K1 == 1):
        Q1 = J1
    elif(J1 == 1):
```

$Q1 = \text{NOT}(Q1)$

```
if(J0 ^ K0 == 1):  
    Q0 = J0  
elif(J0 == 1):  
    Q0 = NOT(Q0)
```

```
Q1 Q0 = 0 0 | G Y R = 0 0 1  
>  
Q1 Q0 = 0 1 | G Y R = 0 1 0  
>  
Q1 Q0 = 1 1 | G Y R = 1 0 0  
>  
Q1 Q0 = 0 0 | G Y R = 0 0 1  
>  
Q1 Q0 = 0 1 | G Y R = 0 1 0  
>  
Q1 Q0 = 1 1 | G Y R = 1 0 0  
>  
Q1 Q0 = 0 0 | G Y R = 0 0 1  
>  
Q1 Q0 = 0 1 | G Y R = 0 1 0  
>  
Q1 Q0 = 1 1 | G Y R = 1 0 0  
>  
Q1 Q0 = 0 0 | G Y R = 0 0 1  
>  
Q1 Q0 = 0 1 | G Y R = 0 1 0  
>  
Q1 Q0 = 1 1 | G Y R = 1 0 0  
>  
Q1 Q0 = 0 0 | G Y R = 0 0 1  
>  
Q1 Q0 = 0 1 | G Y R = 0 1 0  
>  
Q1 Q0 = 1 1 | G Y R = 1 0 0  
>  
■
```

```

Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v
Q1 Q0 = 1 0 | G Y R = 0 0 1
v

```