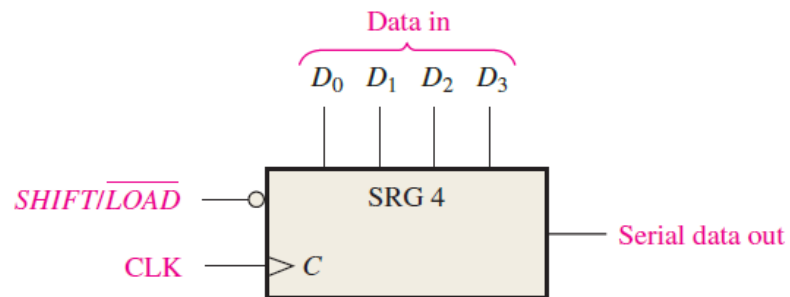
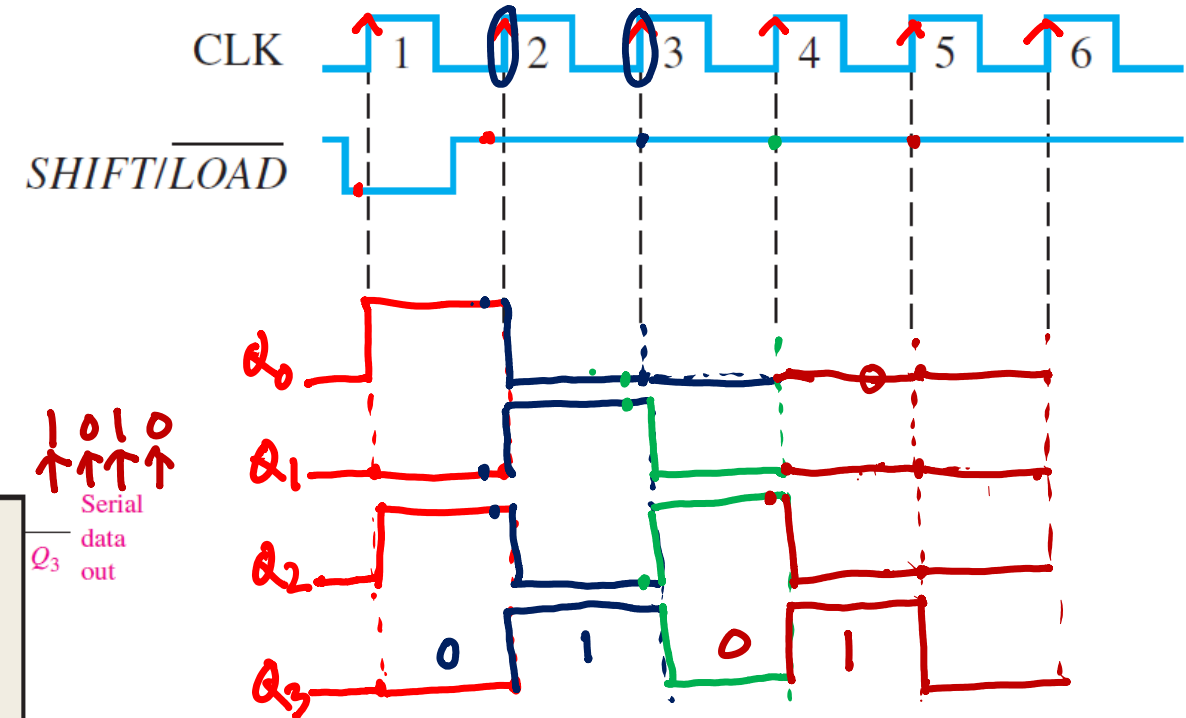
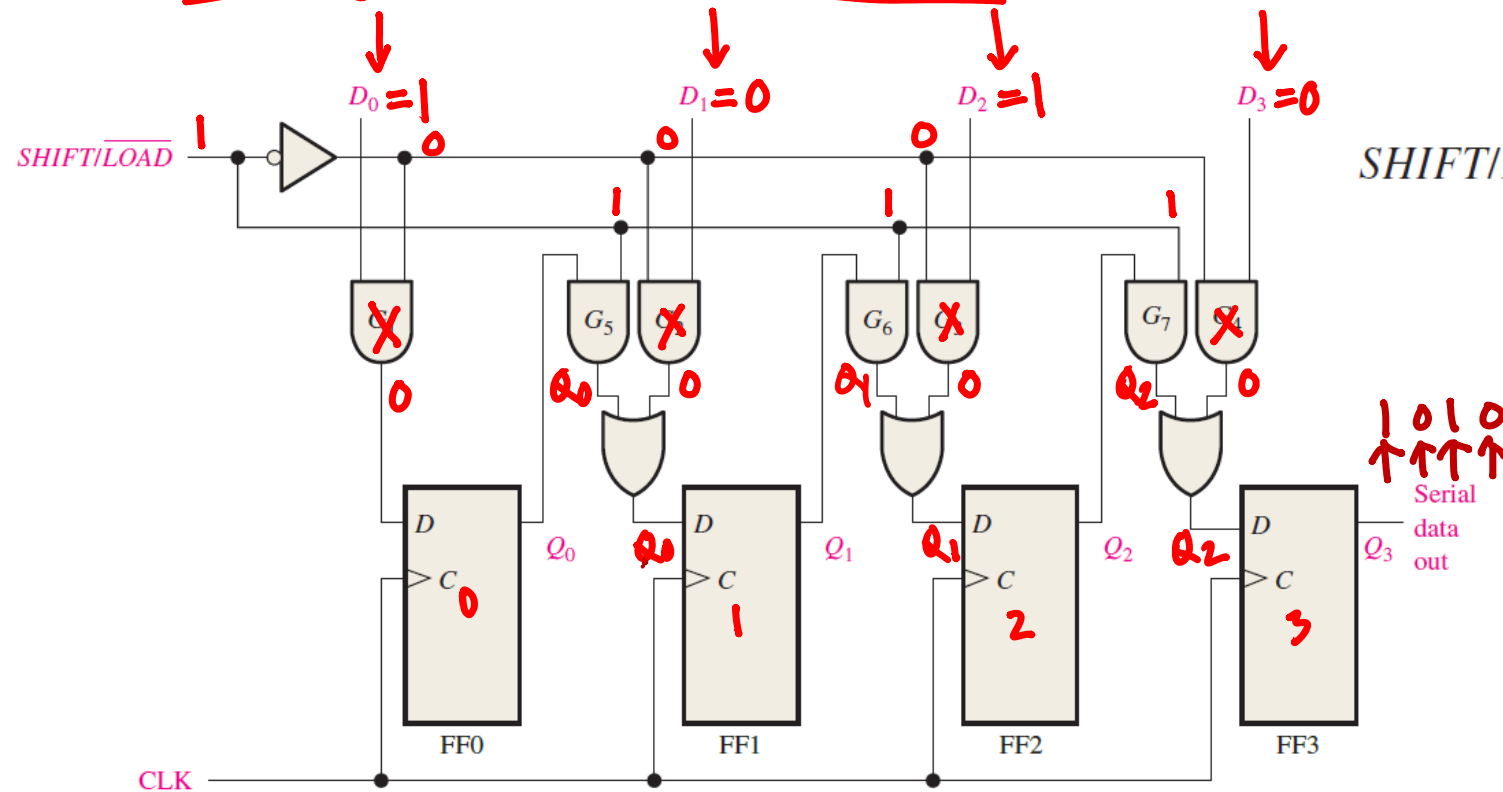


# FLIP-FLOPS

- Parallel data in/ serial data out Shift register:

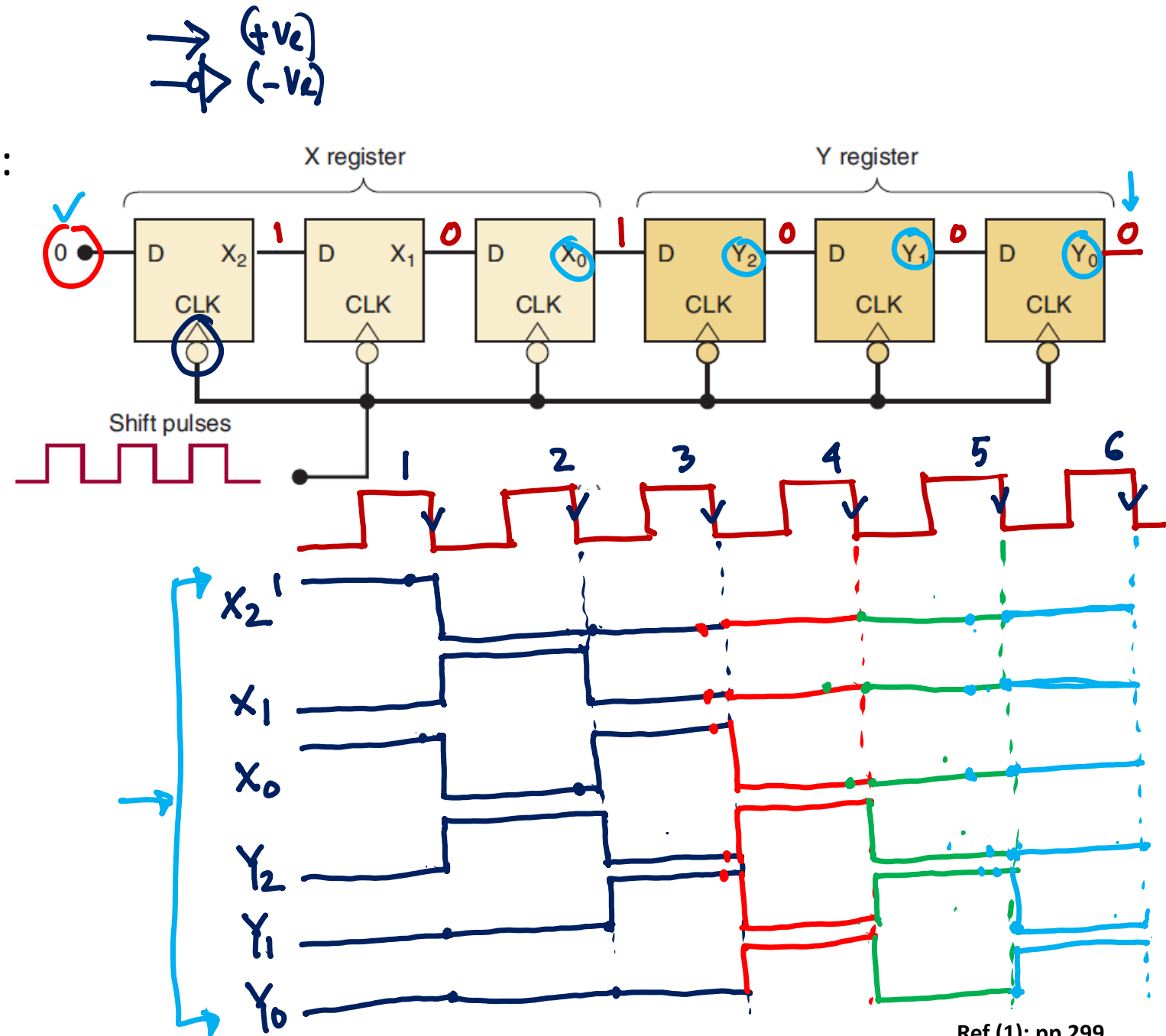
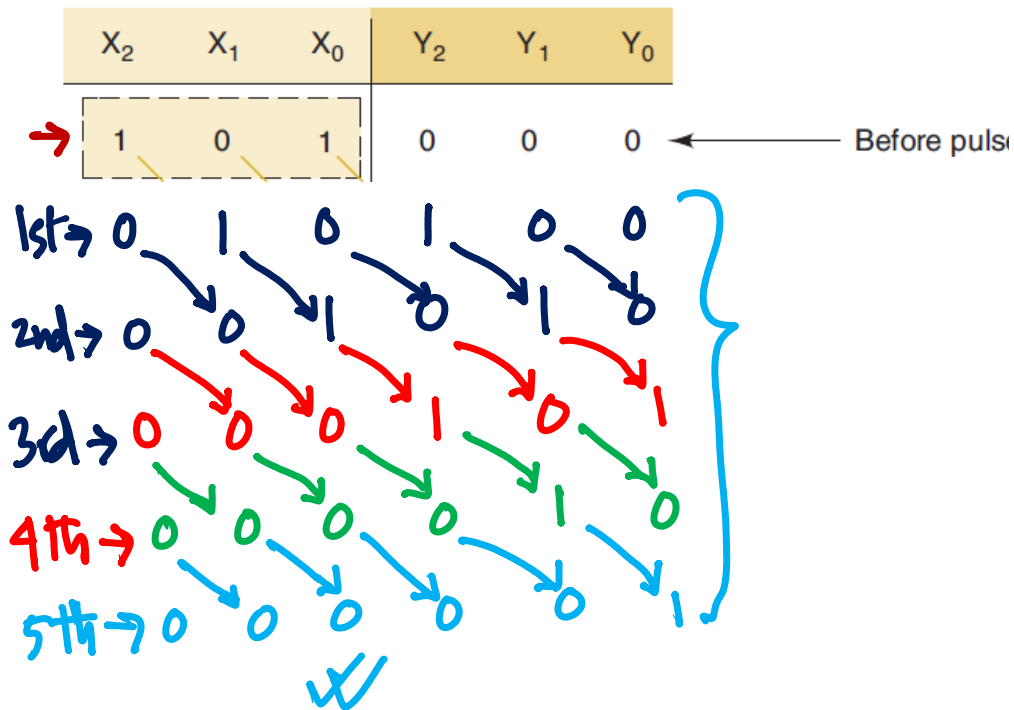
(LSB)  $D_0 D_1 D_2 D_3$  (MSB)

$\rightarrow 1 \ 0 \ 1 \ 0 \leftarrow$   $\text{SHIFT}/\overline{\text{LOAD}} = 0, G_1, G_2, G_3, G_4$



# FLIP-FLOPS

- Serial transfer between registers:



# FLIP-FLOPS

- Bi-directional shift registers:

$\begin{array}{r} \downarrow \downarrow \downarrow \\ \rightarrow 1010 \\ 1100 \\ 0011 \rightarrow \end{array}$

$\text{RIGHT/LEFT} = 1$   
 $\rightarrow G_1, G_2, G_3, G_4$   
 $G_5, G_6, G_7, G_8 \times$   
 Serial data  $\rightarrow G_1 \rightarrow$

$\text{RIGHT/LEFT} = 0$   
 $\rightarrow G_5, G_6, G_7, G_8$   
 $G_1, G_2, G_3, G_4 \times$

