ECE213: Digital Electronics

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The Course Contents

Unit V

Sequential Logic Circuits Applications : Registers: Operation of all basic Shift Registers, Counters: Design of Asynchronous and Synchronous counters, Ring counter and Johnson ring counter

Sequential Logic Circuits Applications

Registers — Shift registers

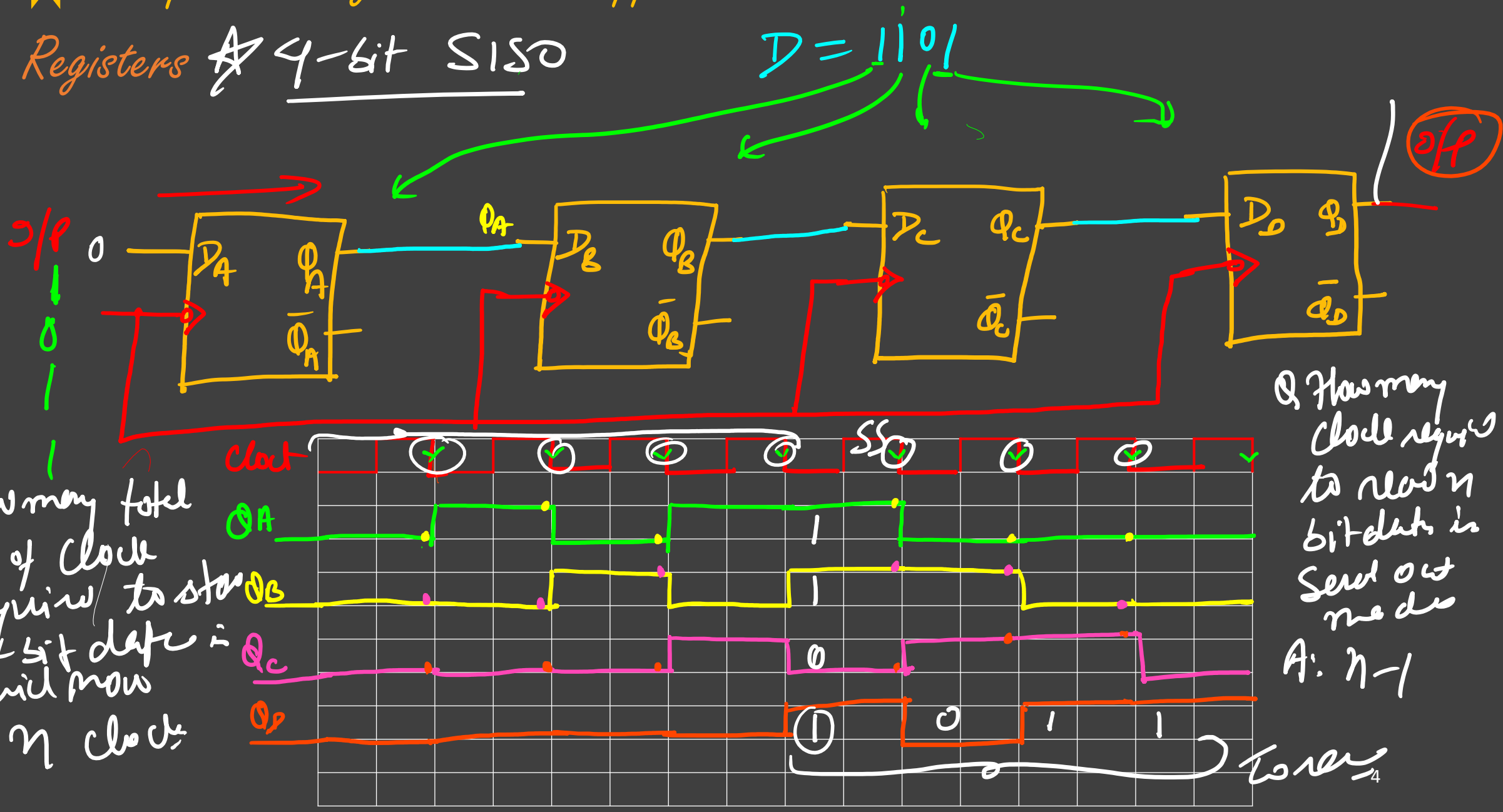
1) SISO (Serial in Serial out)
2) SIPO (Serial in Parallel out)
3) PIPO (Parallel in Parallel out)
4) PISO (Parallel in Serial out)

Q: What is the need of shift register

A:
- To shift the data
- To store the data
- To produce delay
- To convert S/P Serial or Parallel

Sequential Logic Circuits Applications

Registers ★ 4-bit SISO



Q How many total no of clock required to store n bit data in serial mode

A: n clock

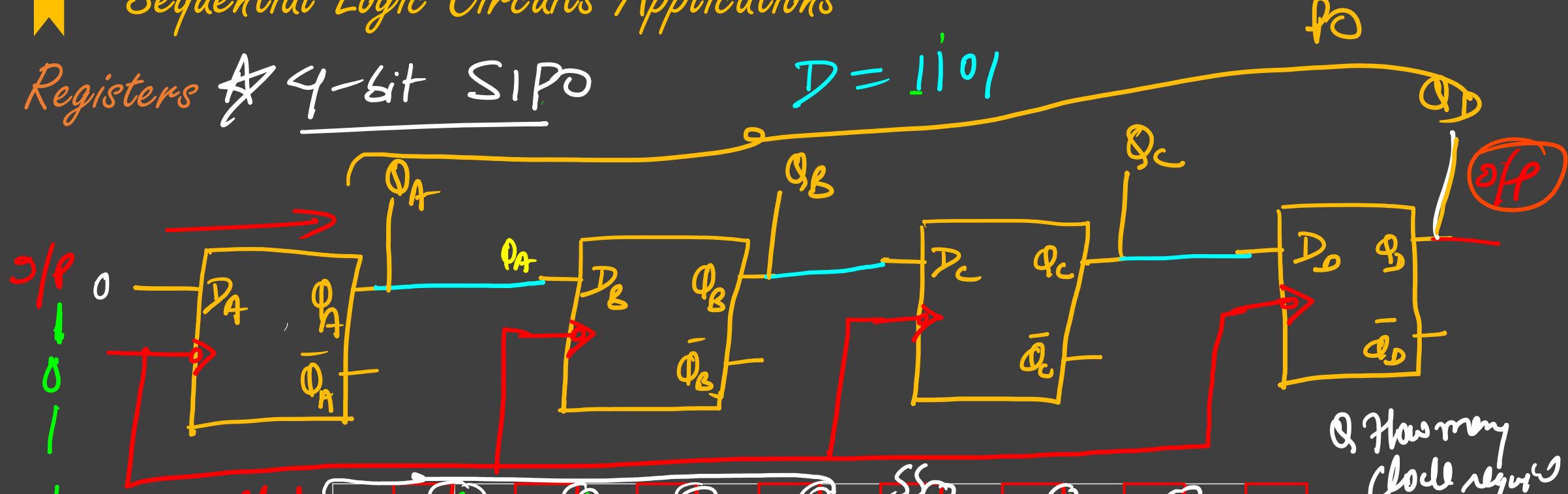
Q How many clock required to read n bit data in serial out mode

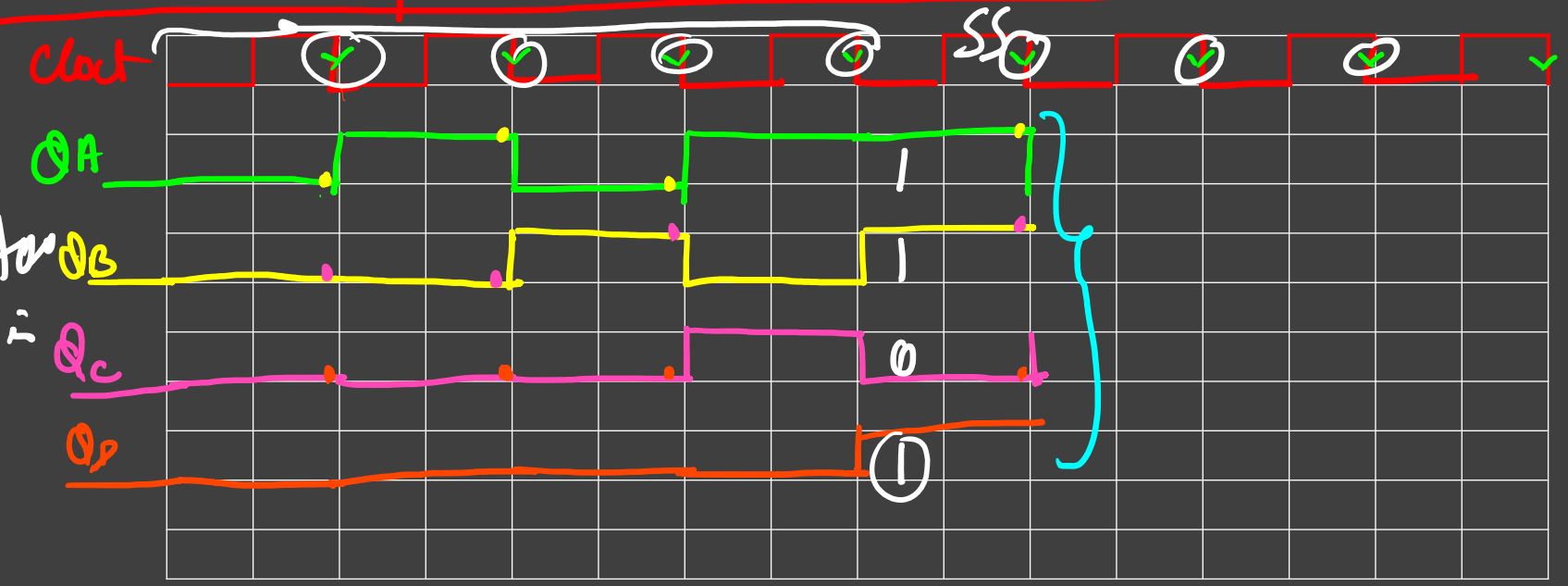
A: n-1

Sequential Logic Circuits Applications

Registers ★ 4-bit SIPO

$D = 1101$





Q How many total no of clock cycles to store 'n' bit data in Serial mode

A: n clocks

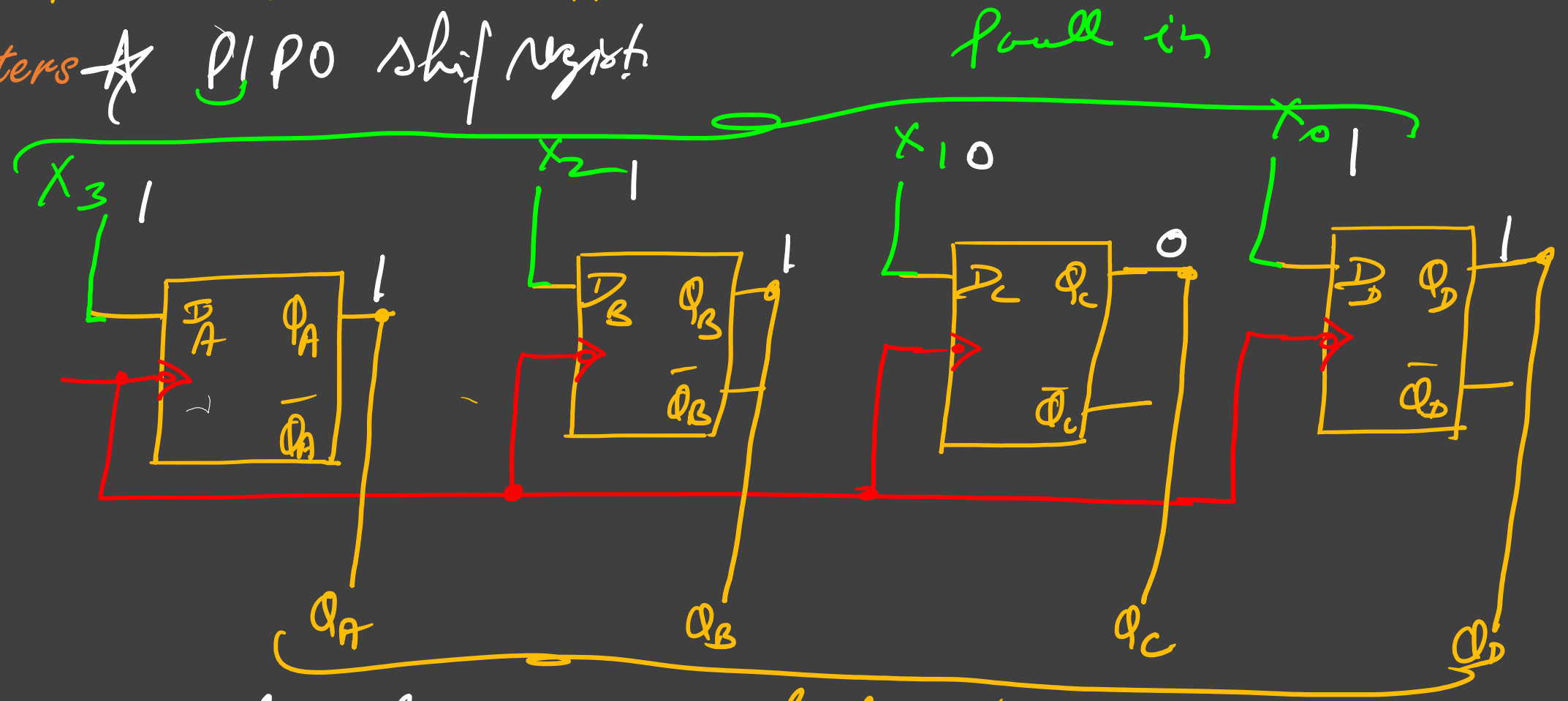
Q How many clock cycles to read 'n' bit data in Parallel out mode

A: Zero clock

No clock

Sequential Logic Circuits Applications

Registers: PIPO shift register



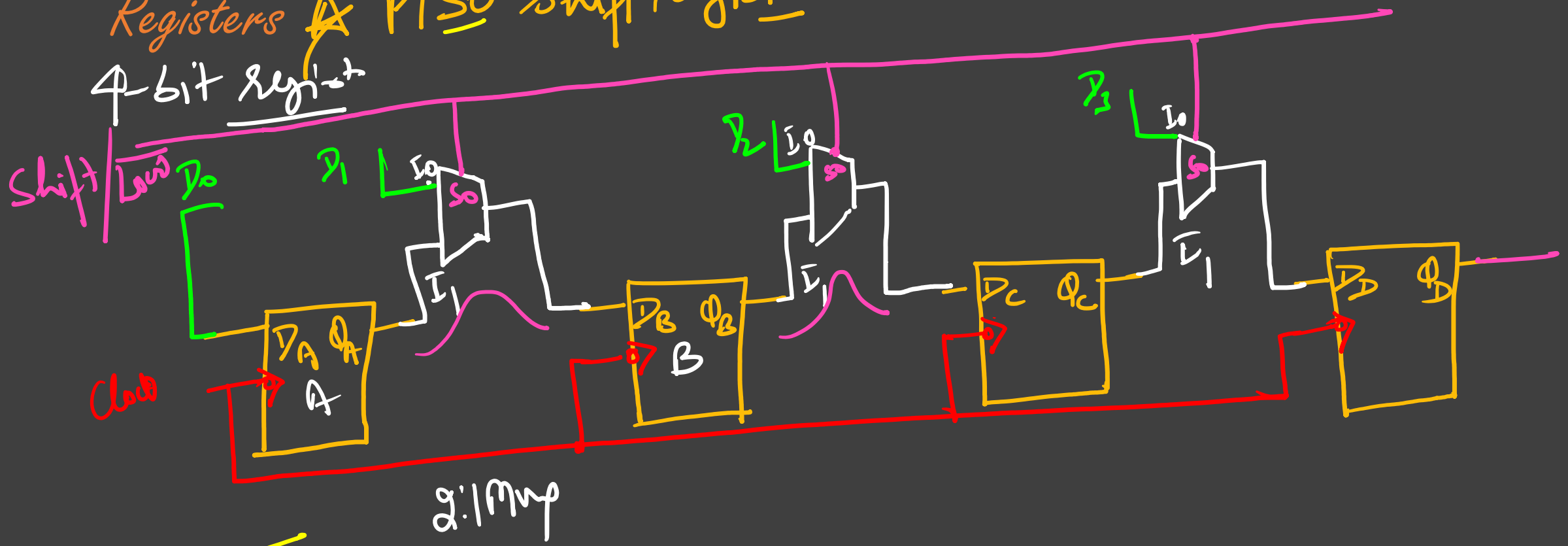
Q: How many clock pulses are required to write the 4-bit data Parallel in mode?

A: One clock pulse.

Sequential Logic Circuits Applications

Registers ~~&~~ PISO shift register

4-bit register



Shift / $\overline{\text{Load}}$

R / $\overline{\text{W}}$

Sequential Logic Circuits Applications

Registers

Q: How many MUX required for n-bit PISO shift register?

A) n

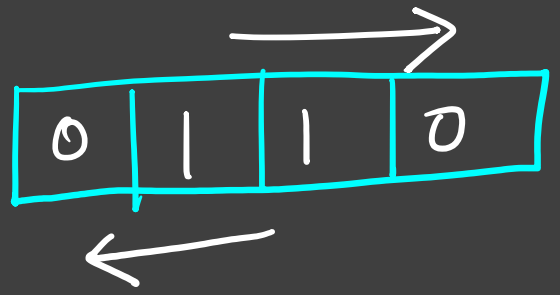
B) $n+1$

C) $n-1$

D) $2n$

Sequential Logic Circuits Applications

Bidirectional Shift Register



To perform the multi - s div by 2.

$(6)_{10} \xrightleftharpoons{\div 2} (3)_{10}$

$(0110)_2 \longleftrightarrow (0011)$

→ Shifty Right Div

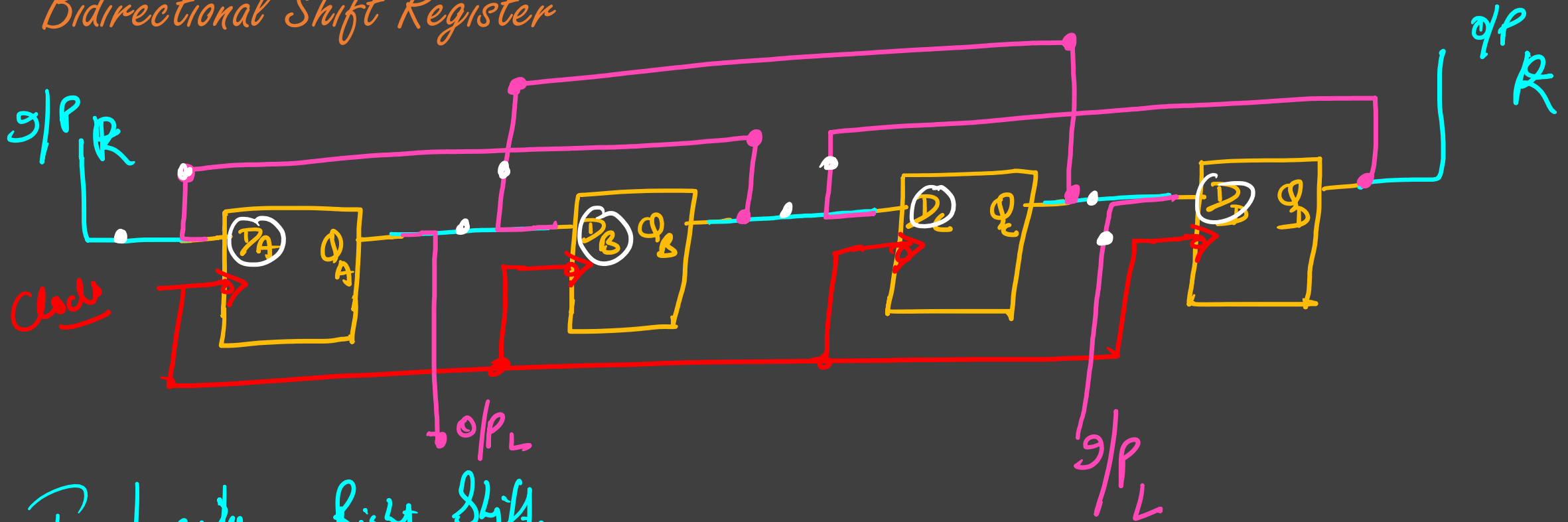
$(6)_{10} \xrightleftharpoons{*2} (12)_{10}$

$(0110)_2 \longleftrightarrow (1100)$

← Shift Left multi.

Sequential Logic Circuits Applications

Bidirectional Shift Register

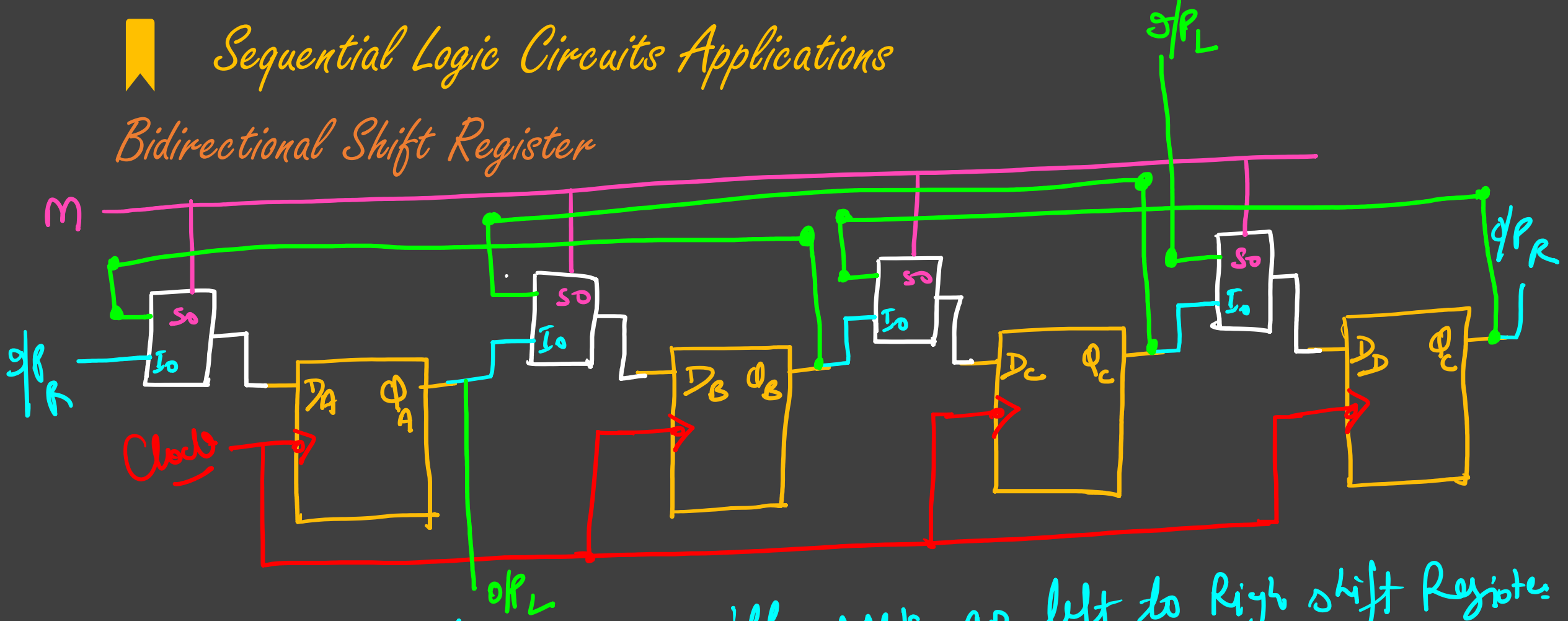


To perform Right Shift.

To perform Left Shift.

Sequential Logic Circuits Applications

Bidirectional Shift Register



If M=0, the above ckt will work as left to Right shift Register

If M=1, the above ckt ——— Right to Left

Sequential Logic Circuits Applications

Bidirectional Shift Register

Q: How many Mux required to make n-bit Bidirectional shift Register

A) n

B) n−1

C) n+1

D) 2n