

ECE213: Digital Electronics



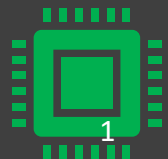
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The Course Contents

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

$\left[\begin{array}{cc} SI & SO \\ SI & PO \\ PI & PO \\ PI & SO \end{array} \right]$ Bidirectional
universal shift

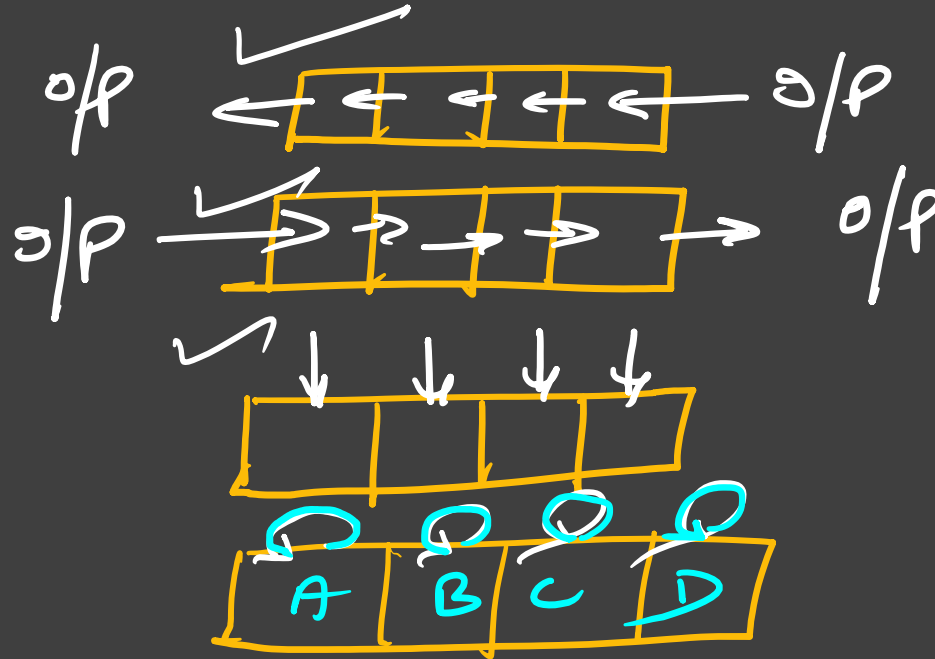


Sequential Logic Circuits Applications

Universal Shift Register

- Shift Left
- Shift Right
- Parallel Load

— No change / Memory

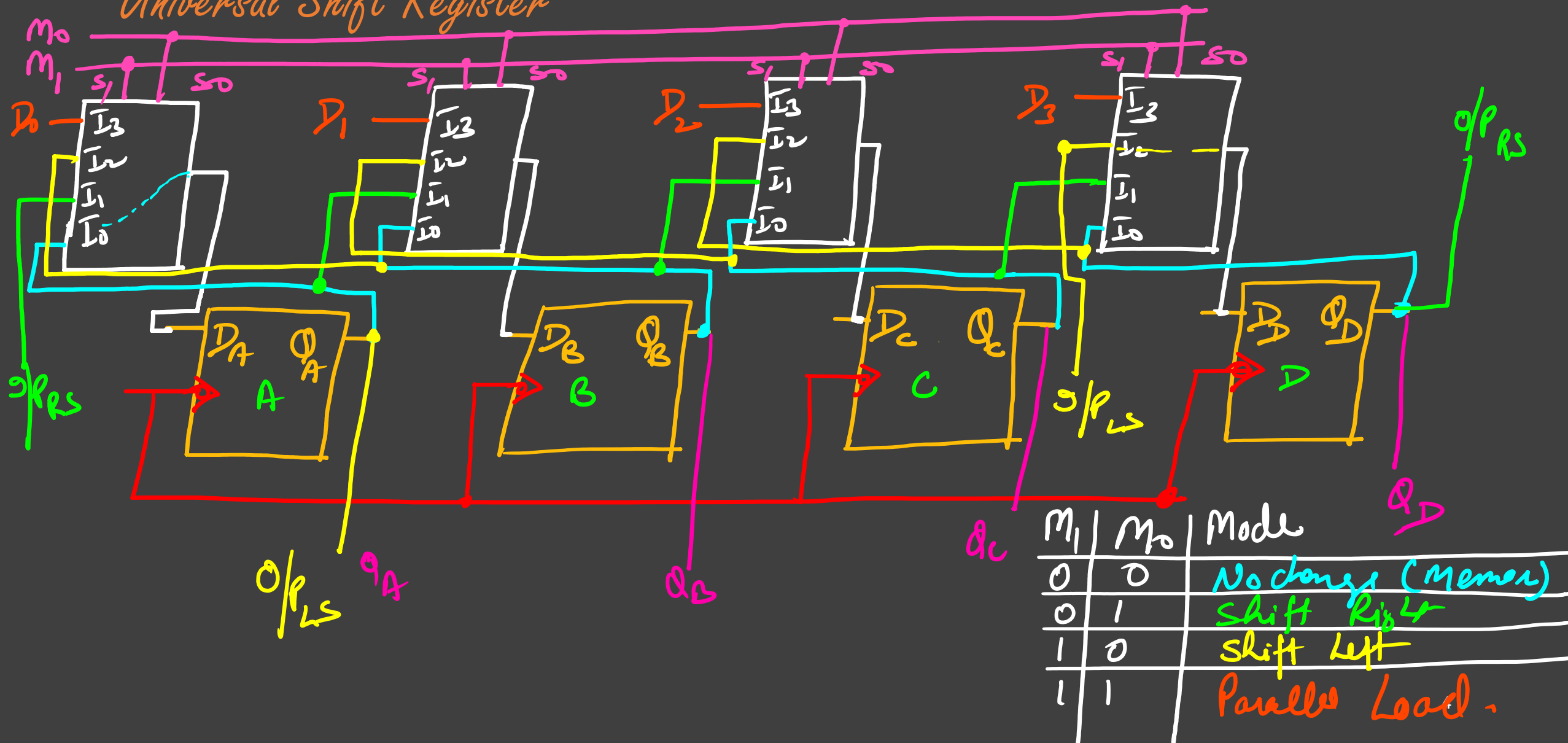


4:1
mux

m_1	m_0	
0	0	No change / Memory
0	1	Left shift
1	0	Right shift
1	1	Parallel load

Sequential Logic Circuits Applications

Universal Shift Register





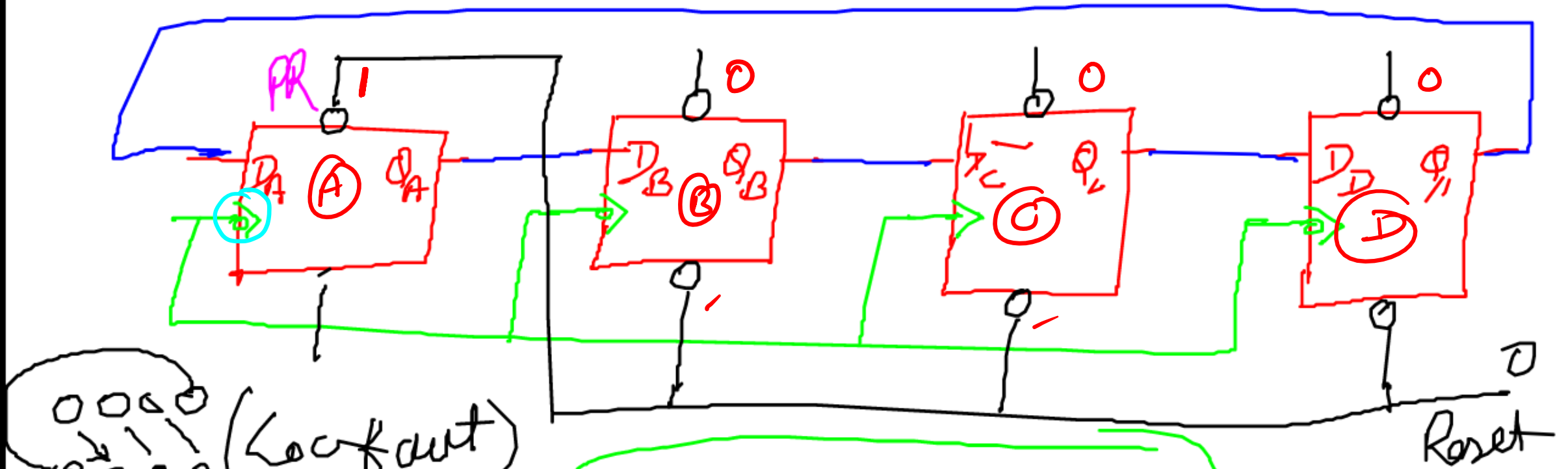
Sequential Logic Circuits Applications

Shift Register

Based on how binary information is entered or shifted out, shift registers are classified into _____ categories.

- a) 2
- b) 3
- c) 4
- d) 5

A Ring Counter 4-bit



0000 (Lockout)

$2^4 = 16$ — 4 (used)
— 12/4m —

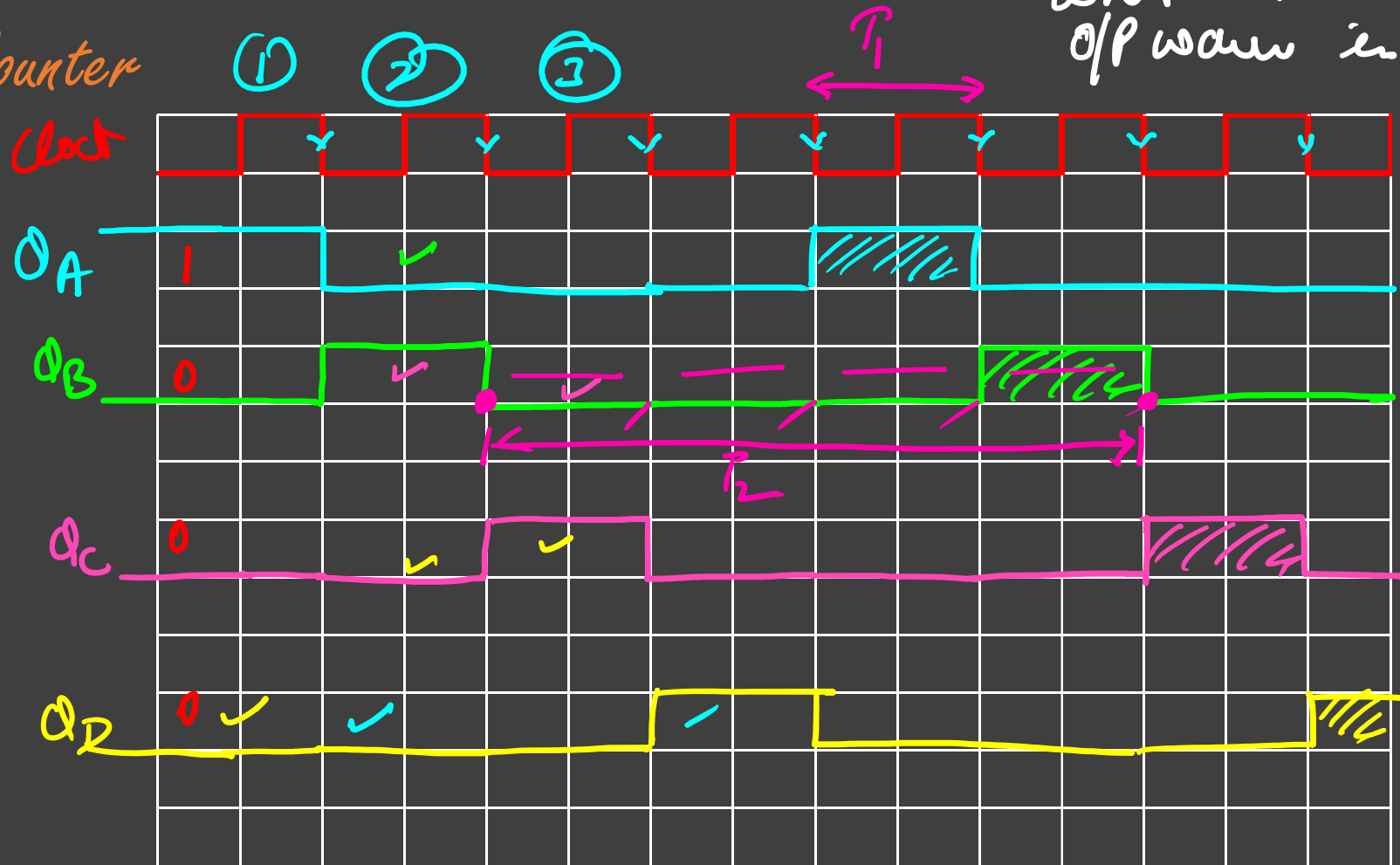
1000 ↓ 1000

↓ 0100
↓ 0010
↓ 0001

Sequential Logic Circuits Applications

Q: If the freq of clock is 20kHz
what will be the freq of
O/P wave in 4-bit Ring Counter

Ring Counter



A1

$$T_2 = 4T_1$$

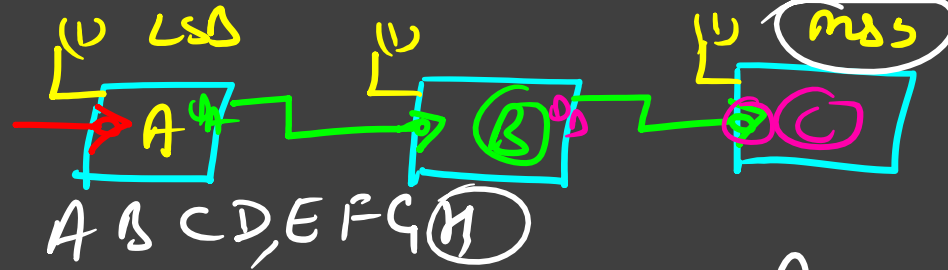
$$f = \frac{1}{T}$$

$$\frac{20}{4} = 5\text{kHz}$$



Sequential Logic Circuits Applications

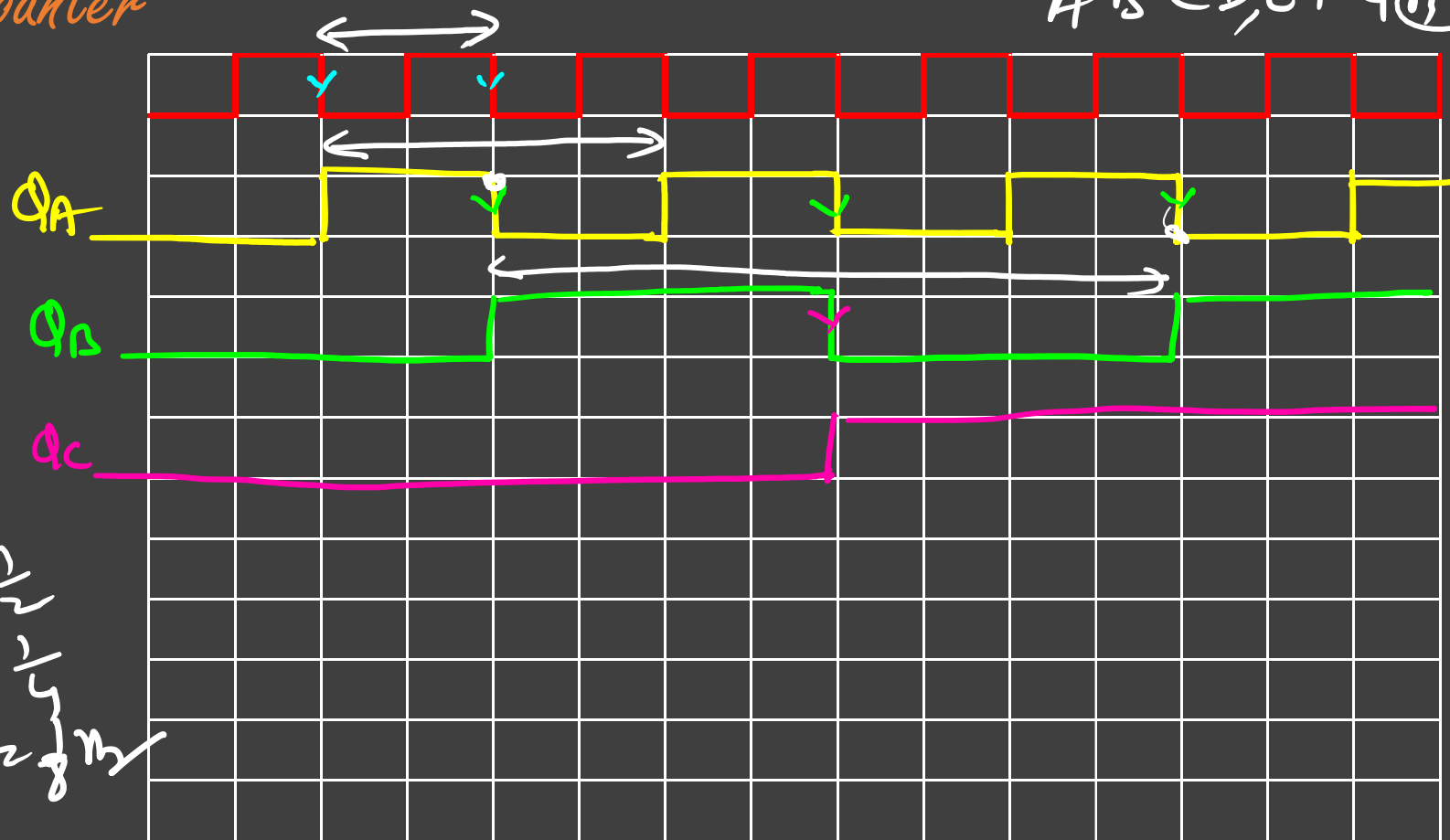
Asyn Counter



$$f_A = 8$$

$$f_B = 4$$

$$f_C = 2$$



If the freq of clock pin is 16Hz then what will be the freq of o/p of each FF in 3-bit Asyn Counter

$$\begin{matrix} 32 \\ A & 16 \\ B & 8 \\ C & 4 \\ D & 2 \\ E & 1 \end{matrix}$$

$$R = \frac{1}{2}$$

$$q = \frac{1}{4}$$

$$n = 8 \text{ Hz}$$

Note! Asyn Counter are also known as freq divider ckt.