



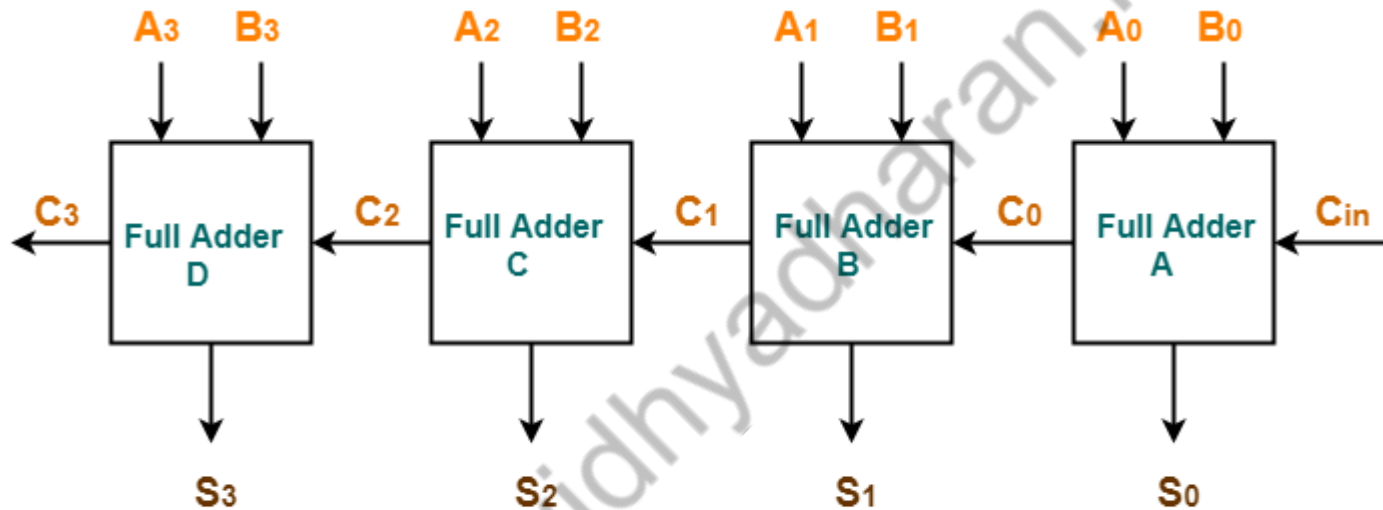
# **Digital Design : 2021-22**

## **Lecture 25 : Applications of Sequential Circuits**

**By Dr. Sanjay Vidhyadharan**

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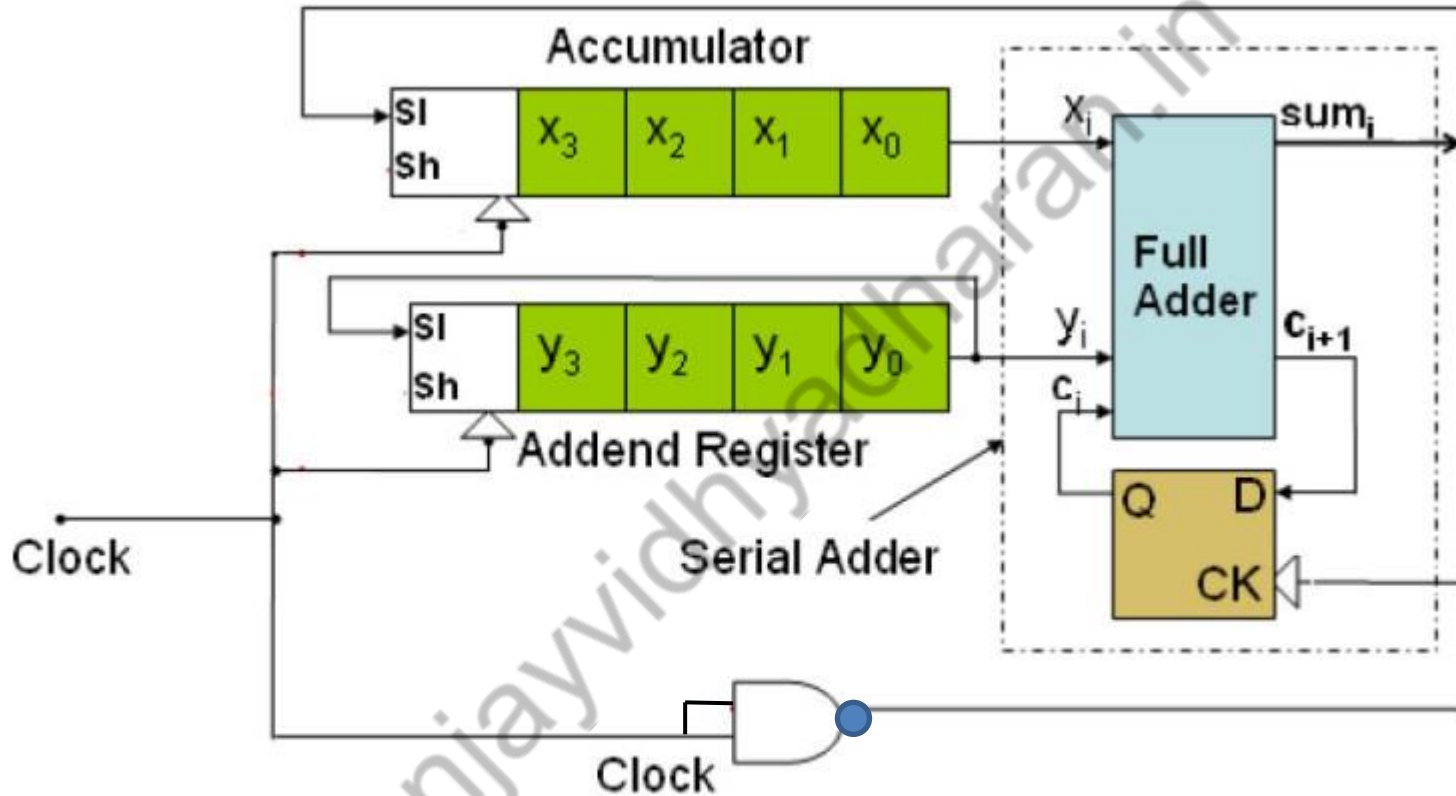
# Ripple Carry Adder



4-bit Ripple Carry Adder

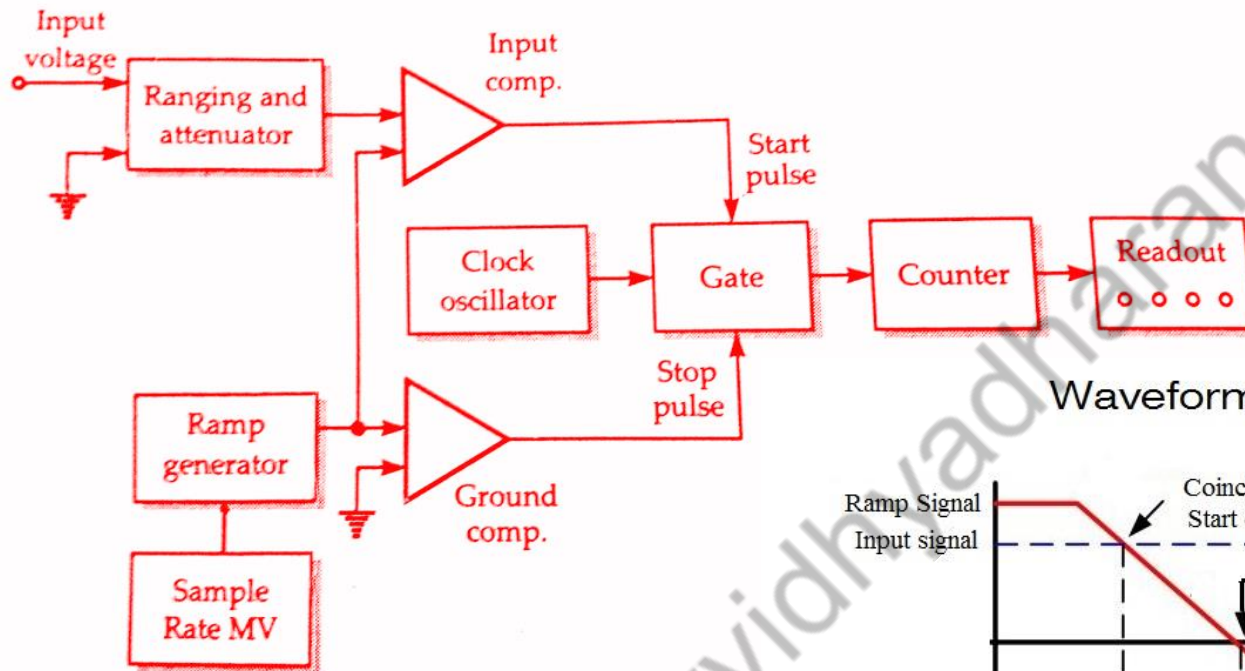
Delay = 4 X Full Adder Delay

# Serial Adder

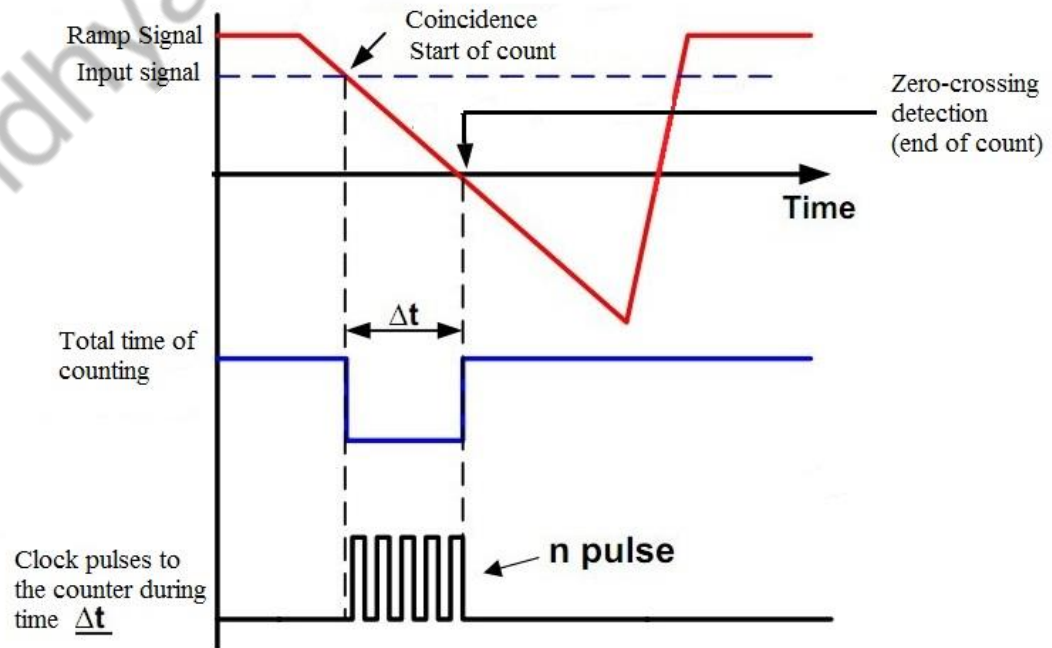


Block Diagram of a 4-bit Serial Adder with Accumulator

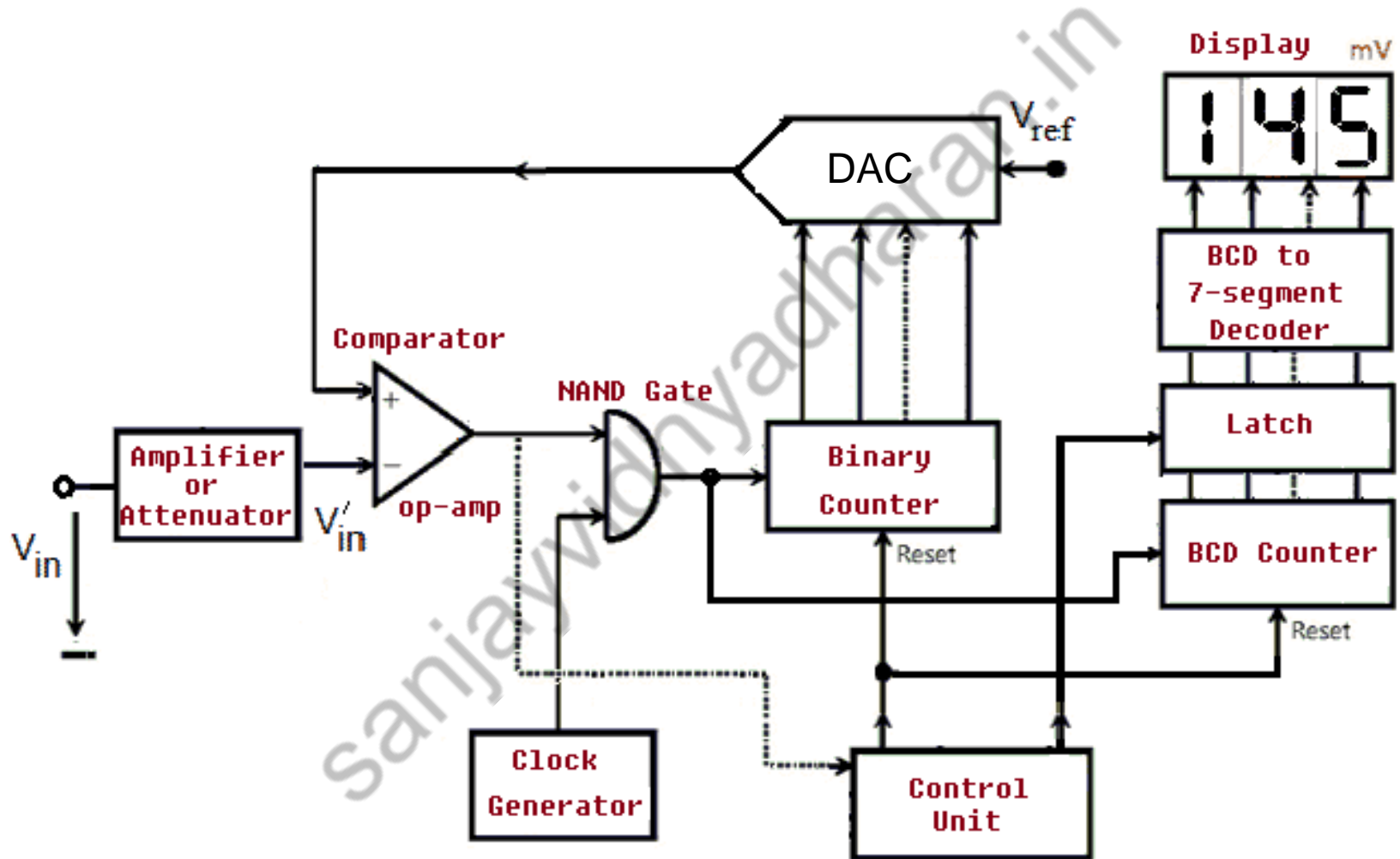
# Counter based Voltmeter



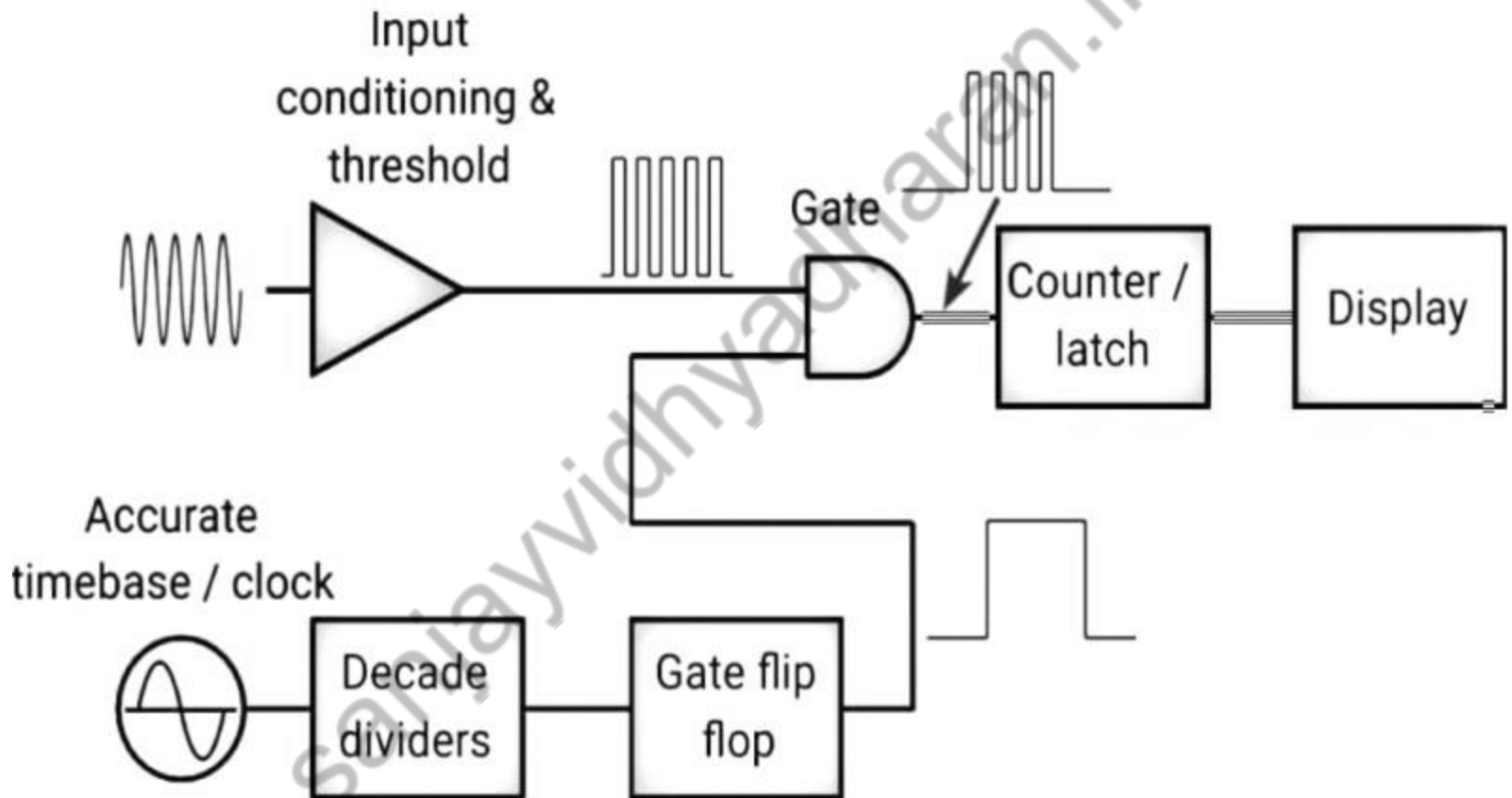
## Waveform Analysis



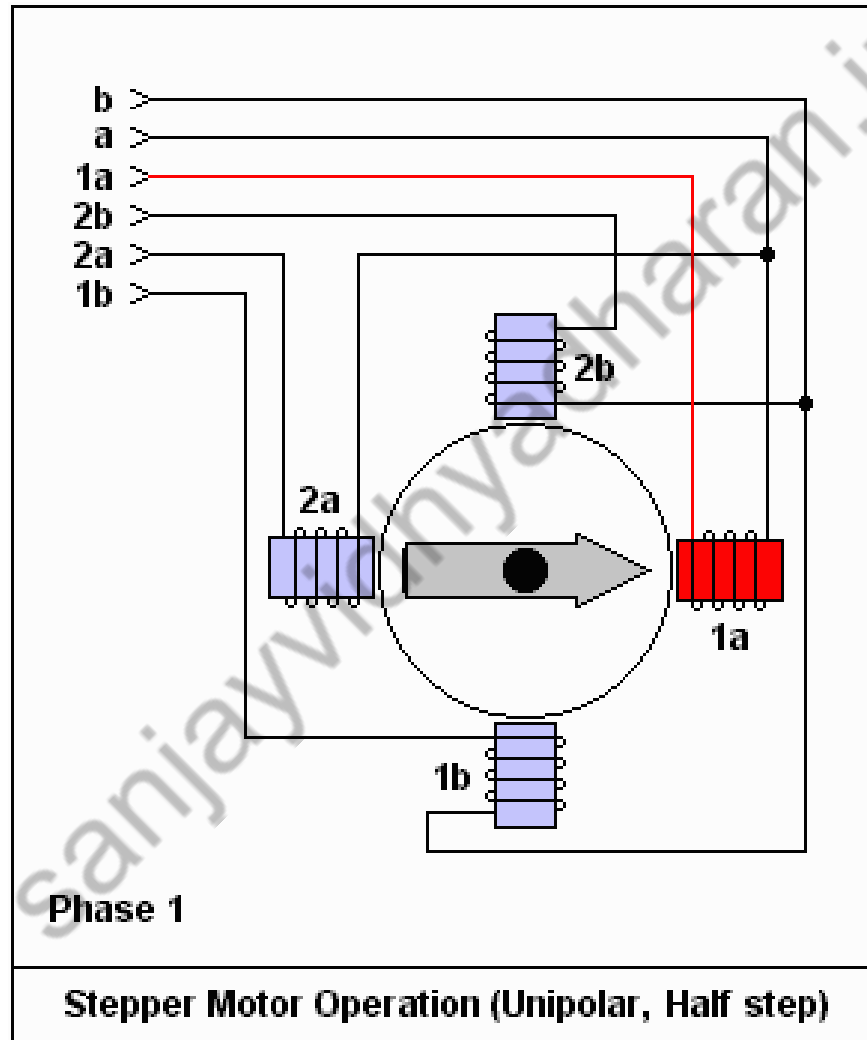
# DAC based Voltmeter



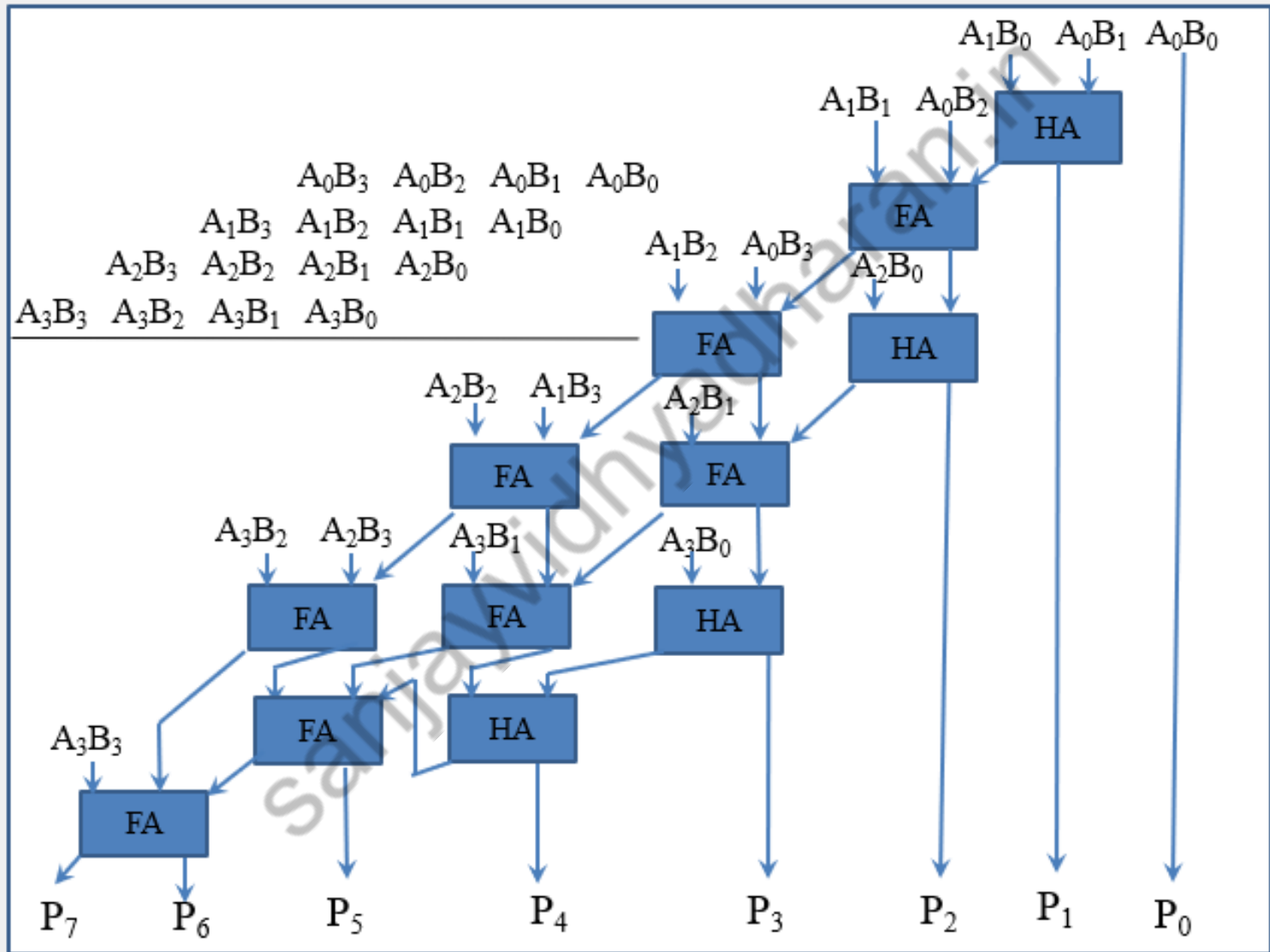
# Counter based Frequency meter



# Stepper Motor



# Multiplier





# Sequential Multiplier

B: 10110110  
A: 10010100

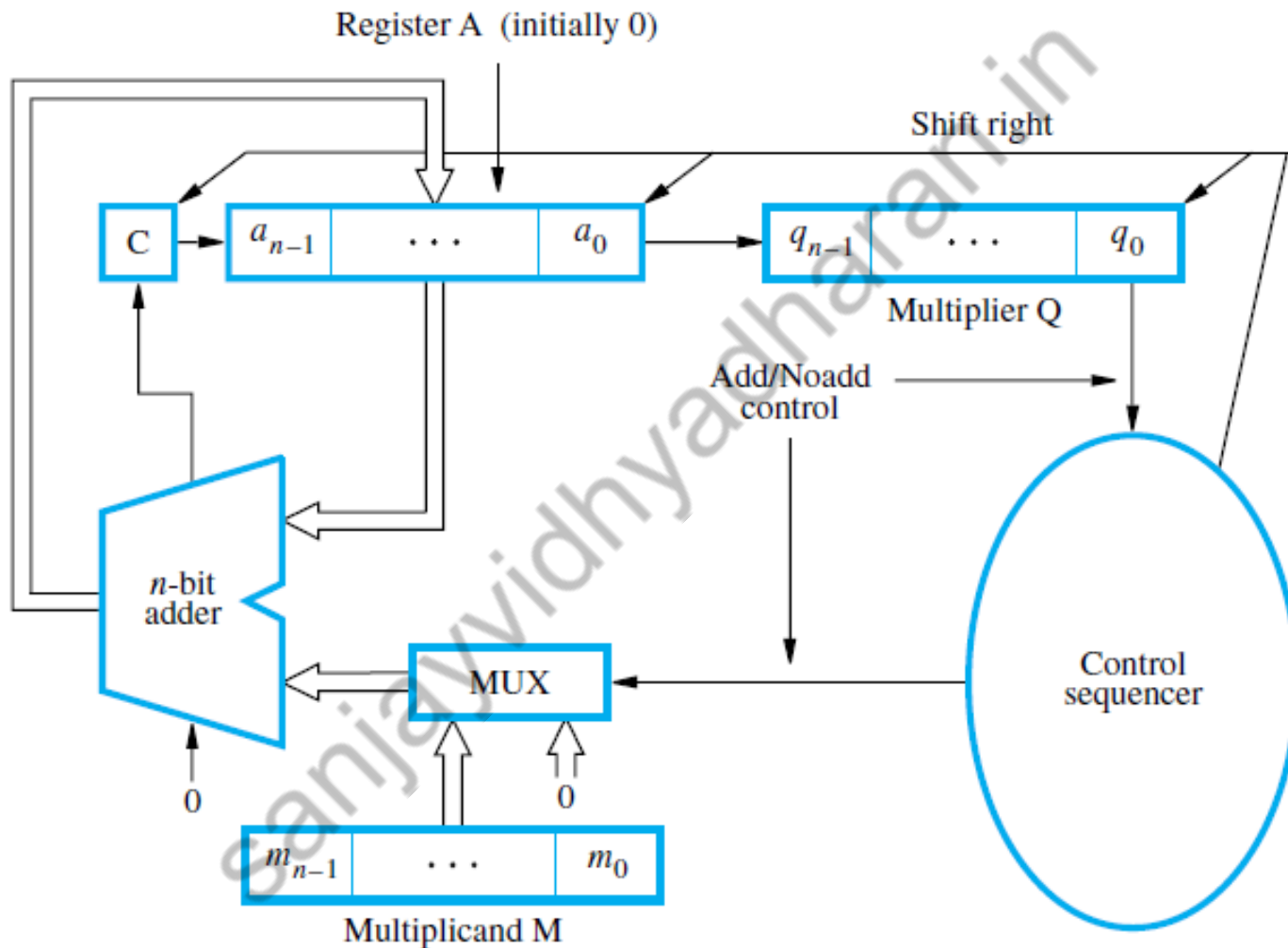
---

00000000  
00000000  
10110110  
00000000  
10110110  
00000000  
00000000  
10110110

---

110100100111000

# Booth Algorithm



(a) Register configuration

# Booth Algorithm

## Example:

	3x5			
	M	A	Q	
Initial Condition	0011	00000	010 <b>1</b>	
Clk ↑ (Load)	0011	00011	0101	1
Clk ↓ (Shift Right)	0011	00001	101 <b>0</b>	
Clk ↑ (Load)	0011	00001	101 <b>0</b>	2
Clk ↓ (Shift Right)	0011	00000	110 <b>1</b>	
Clk ↑ (Load)	0011	00011	110 <b>1</b>	3
Clk ↓ (Shift Right)	0011	00001	111 <b>0</b>	
Clk ↑ (Load)	0011	00001	111 <b>0</b>	4
Clk ↓ (Shift Right)	0011	00000	1111	

# Booth Algorithm

**Example:**

5x6				
	M	A	Q	
Initial Condition	0101	00000	0110	
Clk ↑ (Load)	0101	00000	0110	1
Clk ↓ (Shift Right)	0101	00000	0011	
Clk ↑ (Load)	0101	00101	0011	2
Clk ↓ (Shift Right)	0101	00010	1001	
Clk ↑ (Load)	0101	00111	1001	3
Clk ↓ (Shift Right)	0101	00011	1100	
Clk ↑ (Load)	0101	00011	1100	4
Clk ↓ (Shift Right)	0101	00001	1110	

**Thank you**

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