Division Algorithm for Signed Magnitude Data

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- The **Division** of two fixed-point binary numbers in the signed-magnitude representation is done by the **cycle of successive compare, shift, and subtract operations**
- The **binary division** is **easier** than the **decimal division** because the **quotient digit** is **either 0 or 1**
- There is no need to estimate how many times the dividend or partial remainders adjust to the divisor

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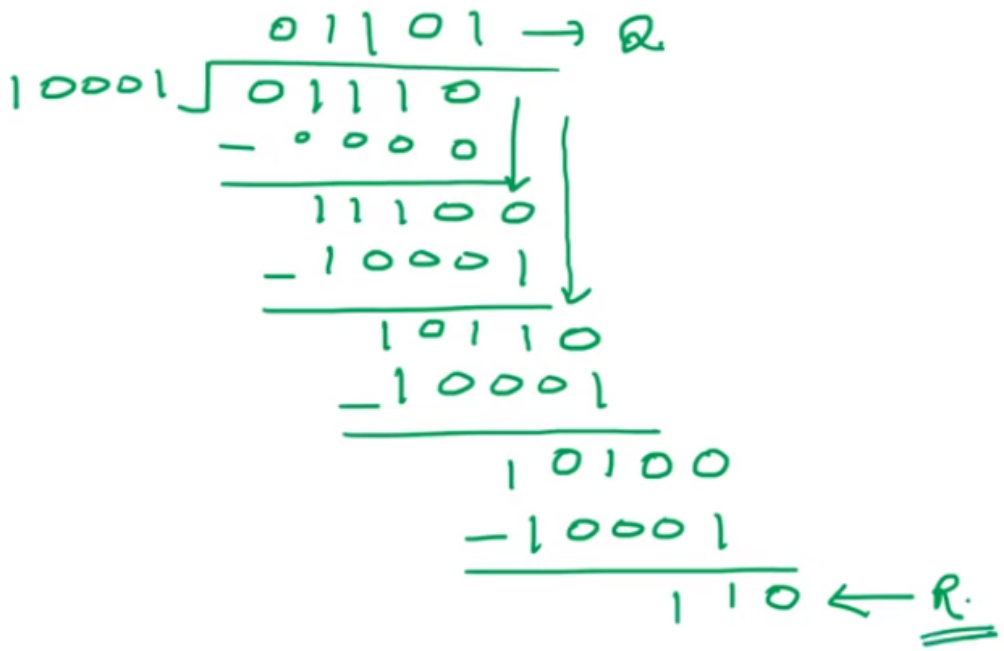
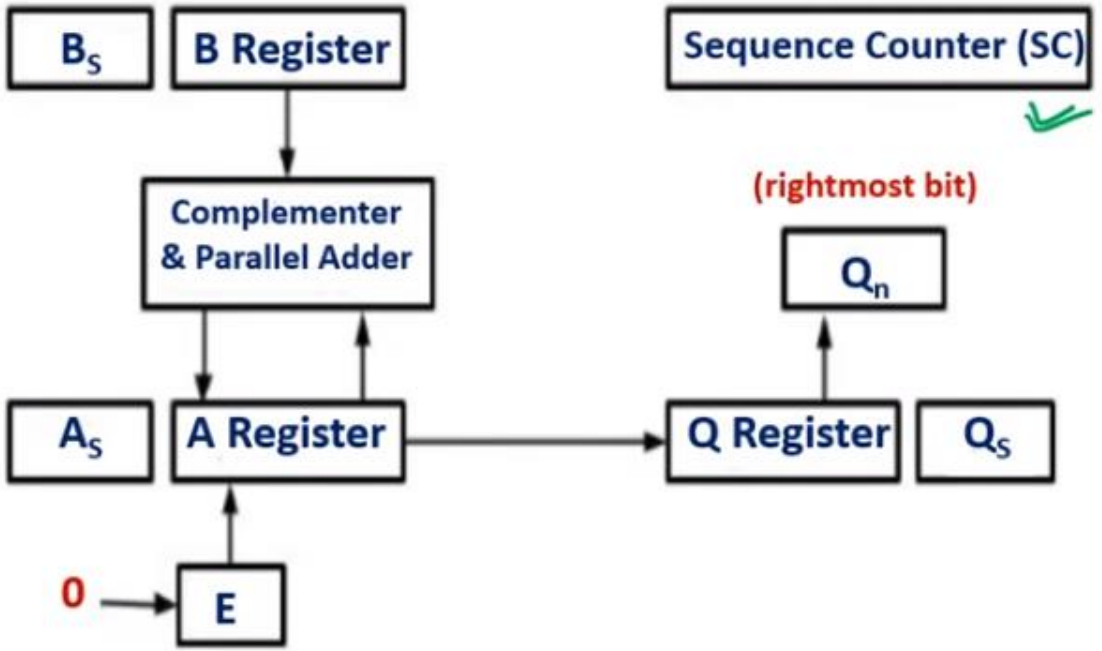


Dividend (A): 01110
Divisor (B): 10001

Quotient:?
Remainder:?

A < B , Q = 0
1

Division Algorithm for Signed Magnitude Data

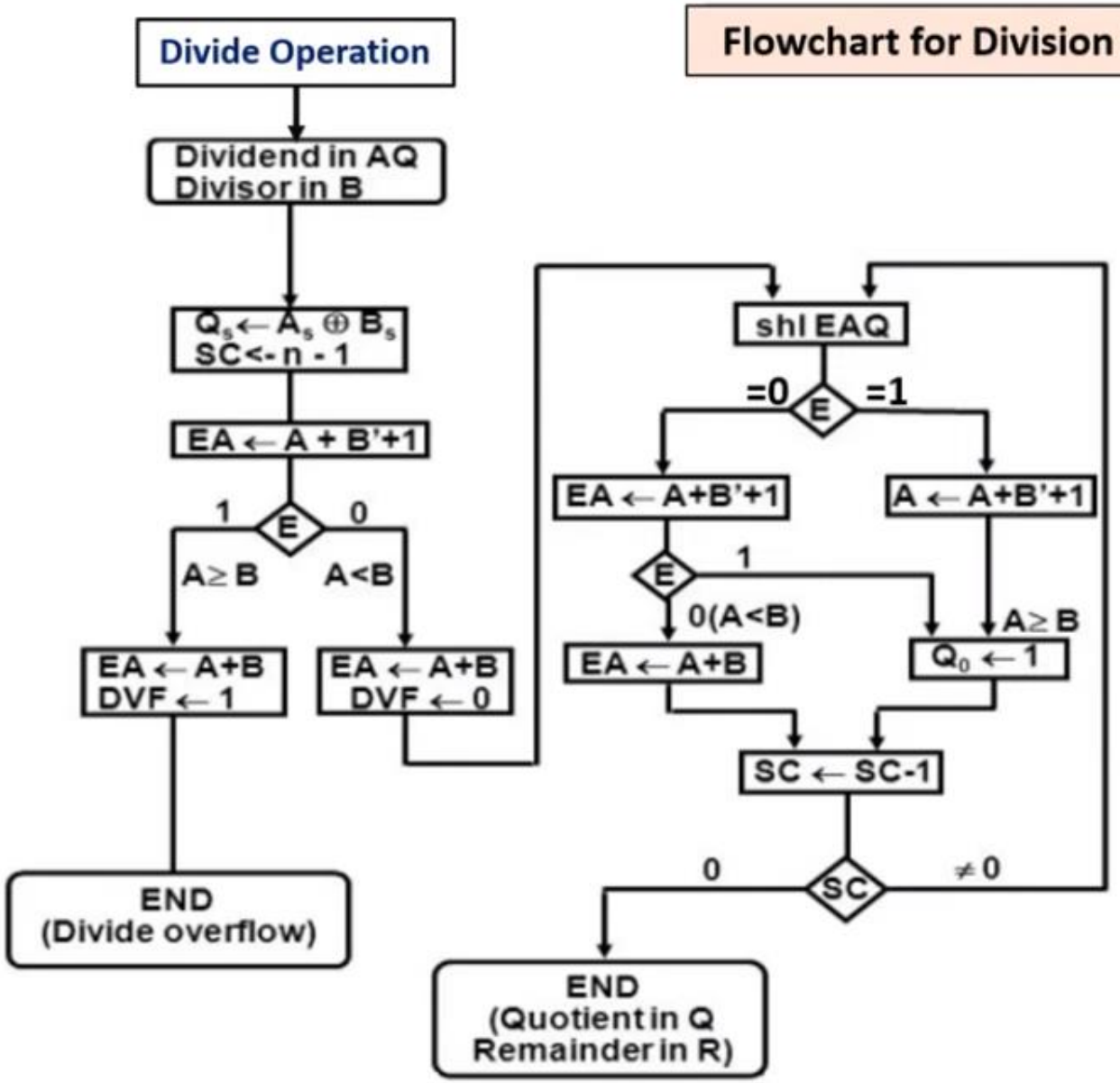


Hardware Implementation for Divide Operation

- The hardware implementation in the division operation is **identical** to that required for multiplication
- Here, **Registers B** is used to **store divisor** and the **double-length dividend** is stored in **registers A and Q**
- The information for the relative magnitude is given in E
- Sequence Counter register **(SC)** is used to store the number of bits in the dividend

E A Q

Division Algorithm for Signed Magnitude Data



Flowchart for Division Operation

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- The **binary division** is **easier** than the **decimal division** because the **quotient digit** is **either 0 or 1**

Division Algorithm for Signed Magnitude Data

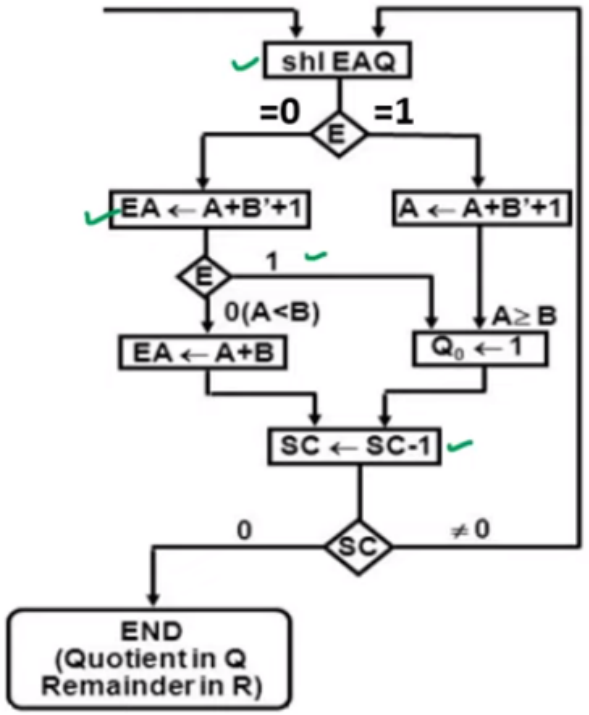
OPERATION	E	A	Q	SC
Initial	0	01110	00000	5
shl EAQ	0	11100	00000	
A + B' + 1		+01111		
	1	01011	00001	4

Question: Compute 01110 / 10001

- **Dividend (A) = 01110**
- **Divisor (B) = 10001**

Initially A = 0000, Q = 00000, SC =5

B' = 01110
B' + 1 = 01111



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shl	0	10110	00010	
A+B̄+1		+01111		
	1	00101	00011	3

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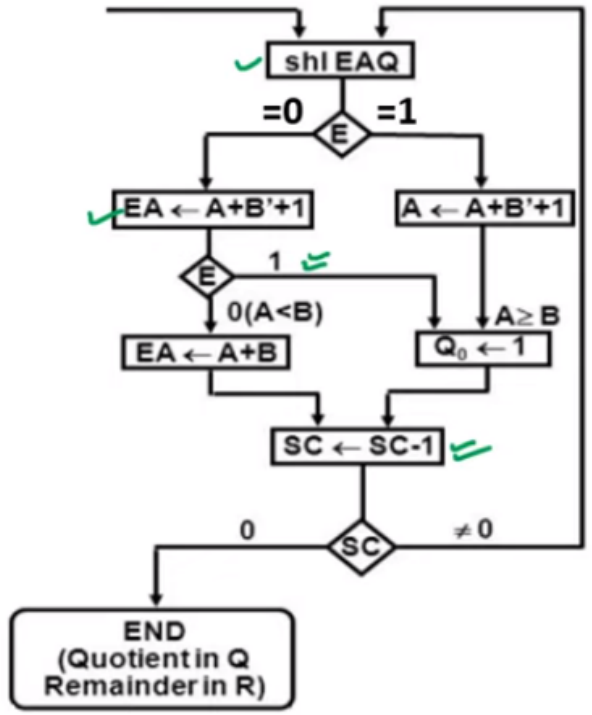

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A+B'+1		+01111		
	1	00101	00011	3
shl	0	01010	00110	
A+B'+1		+01111		
		11001		
A+B		+10001		
	1	01010	00110	2

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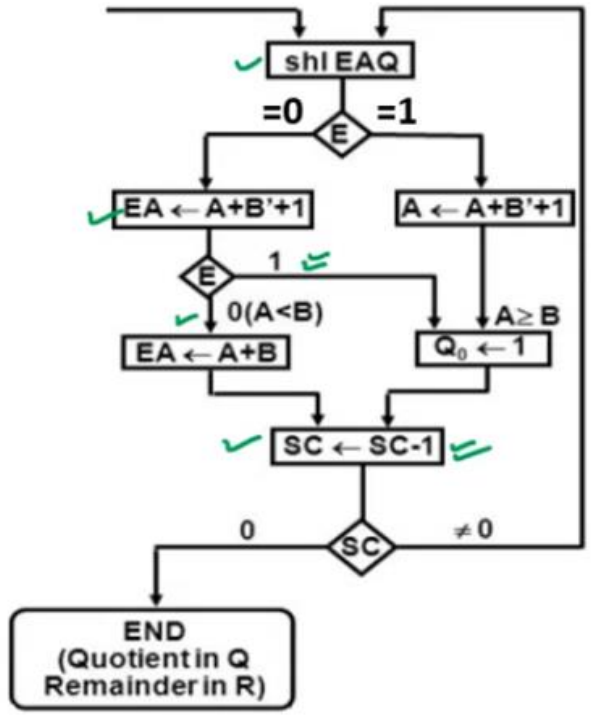

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shl	0	10100	01100	
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	1	00011	01101	1.

Question: Compute 01110 / 10001

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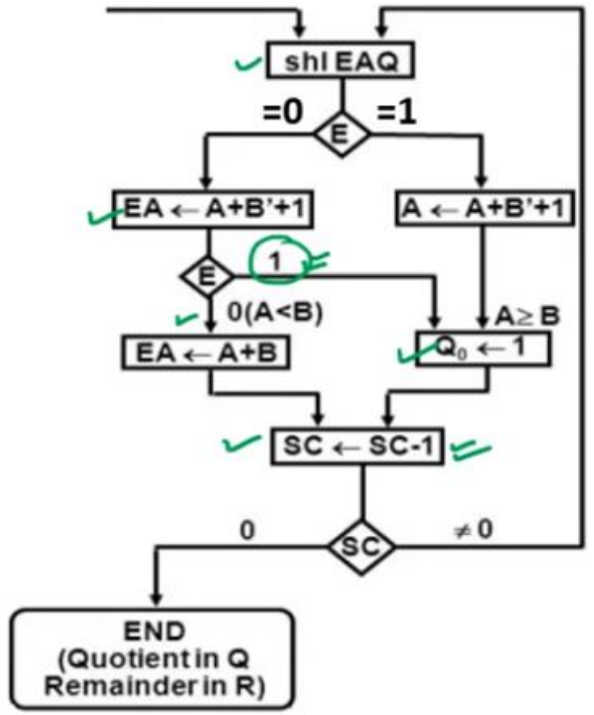

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A + B' + 1	1	11001		
A + B	1	01010	00110	2
shl EAQ	0	10100	01100	
A + B' + 1	1	00011	01101	1
shl EAQ	0	00110	11010	
A + B' + 1	1	00110 (R)	11010 (Q)	0 ← END

Question: Compute 01110 / 10001

- Dividend (A) = 01110
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B' = 01110
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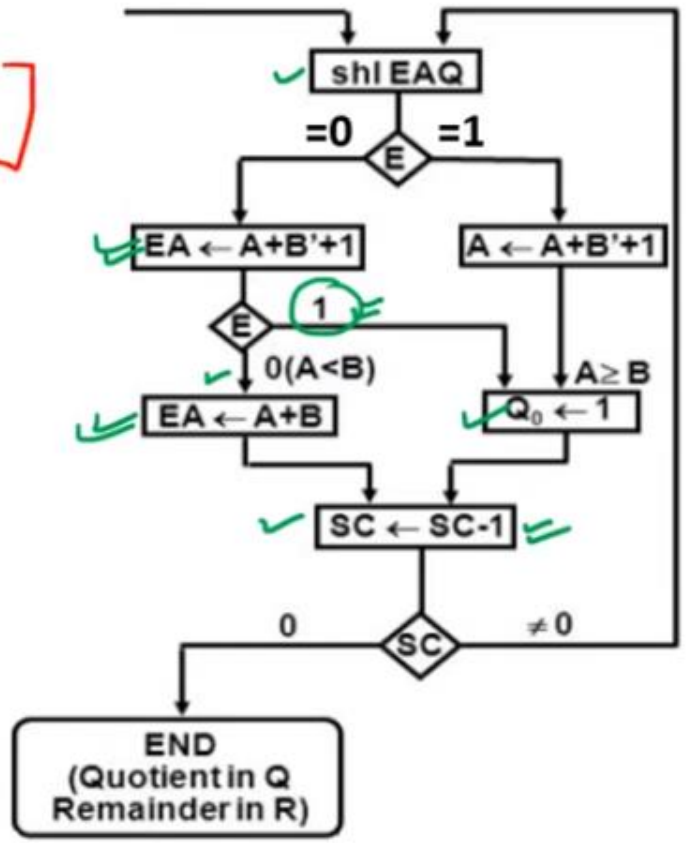
Initially A = 0000, Q = 00000, SC =5

R = 00110
Q = 11010



Practice Problems

1. Compute 21 / 5 by Restoring algorithm for signed magnitude data.
2. Solve 11010 / 1011 by Restoring algorithm for signed magnitude data.