

COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT -III

TOPIC- FLOATING POINT DIVISION PART-1

Floating Point Division

Introduction

- Floating Point division requires that the exponents be subtracted and the mantissa divided.
- The mantissa division is done as in fixed point division.
- The division algorithm can be divided into five parts:

1. Check for zeros.
2. Initialize the registers and evaluate the sign.
3. Align the dividend
4. Subtract the exponents.
5. Divide the mantissa.

Flowchart:

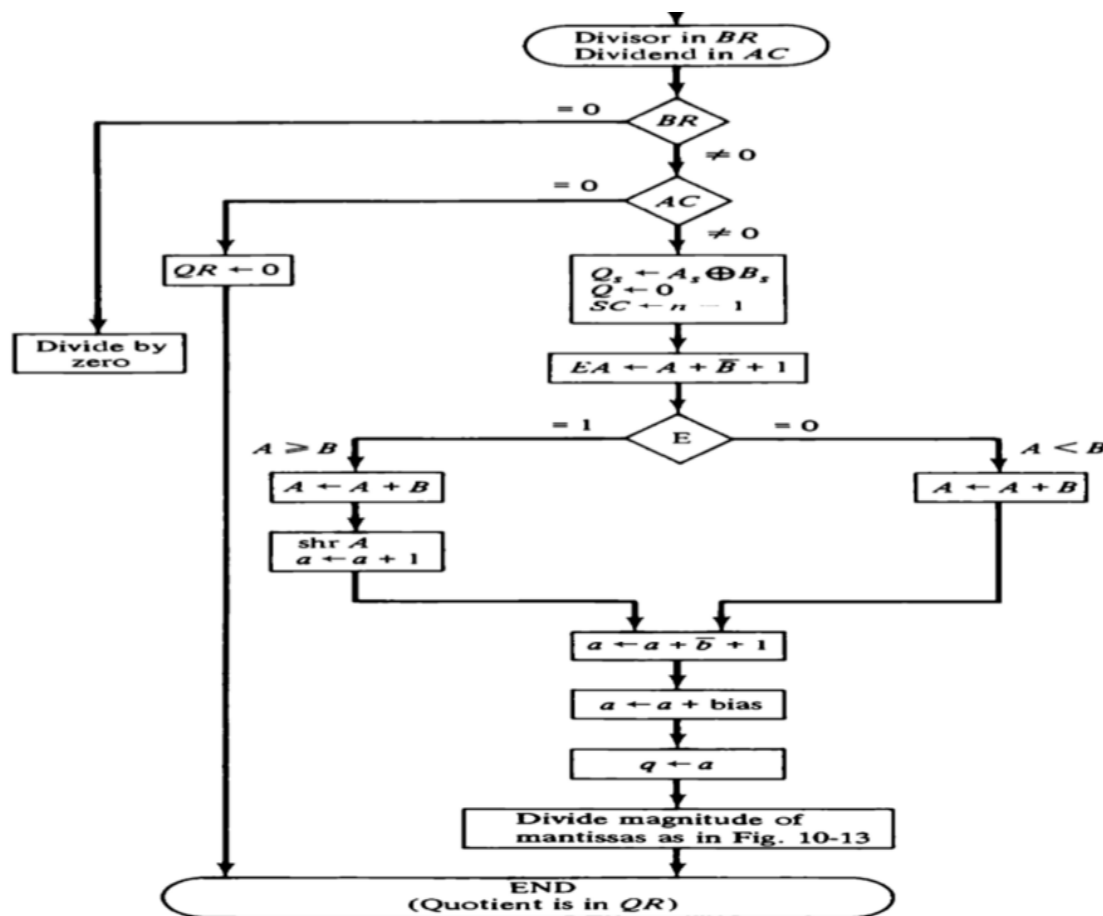


Figure 10-17 Division of floating-point numbers.

1. Check for zeros

If $BR = 0$, Divide by zero

If $AC = 0$, Result $QR \leftarrow 0$

If $AC=BR \neq 0$ (Not equal to) 0, goto step 2

- The two operands are checked for zero.
- If the divisor (BR) is zero, it indicates an attempt to divide by zero, which is an illegal operation.
- The operation is terminated with an error message.
- If the dividend (AC) is zero, the quotient QR becomes zero.

2. Initialize the registers and evaluate the sign.

- Determine the sign of the quotient and store it in Q_s .
- The XOR of the sign of the dividend in A_s and the sign of the divisor in Q_s becomes the sign of the quotient.

$$Q_s \leftarrow A_s + B_s$$

- The sign of the dividend in A_s , is left unchanged to be the sign of the remainder.
- The Q register is cleared to 0 and the sequence counter sc is set to a number equal to the number of bits in the quotient.

$$Q \leftarrow 0, SC \leftarrow n-1$$

3. Align the dividend (or) check for divide overflow

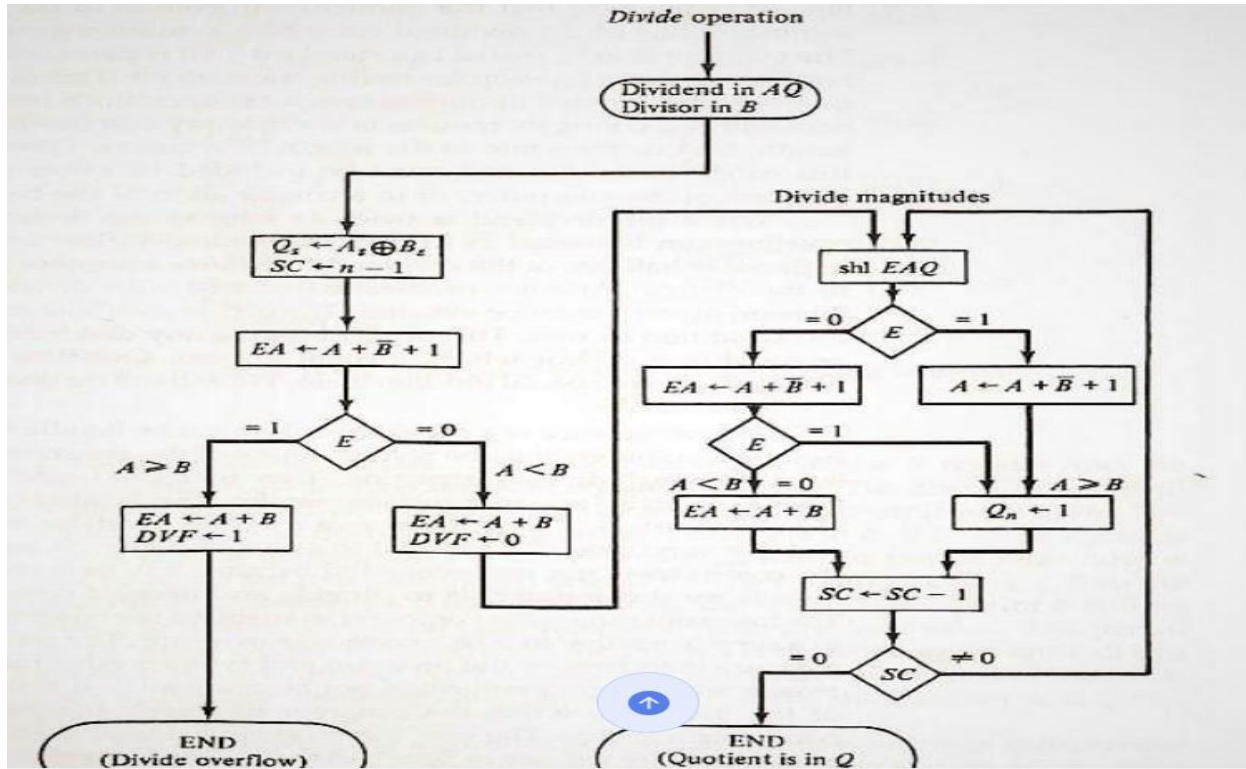
- The dividend alignment is similar to the divide-overflow check in the fixed-point division operation.
- Check if there is an overflow or not.
- To check overflow, subtract the divisor from the dividend.
- If carry =0, no overflow ($A < B$), restore the dividend.
- If carry =1, overflow ($A \geq B$), perform a shift right on A & increment the exponent and then restore the dividend.

4. Subtract the exponents.

- Next, the divisor exponent is subtracted from the dividend exponent.
- The result transferred into q because the quotient is formed in QR.

5. Divide the mantissa.

- The magnitudes of the mantissas are divided as in the fixed-point division.
- After the operation, the mantissa quotient resides in Q and the remainder in A. (Sign Magnitude Division)
- The floating-point quotient is already normalized and resides in QR.



Flowchart of Signed Magnitude Division