

1. What is the Advantages of using Booth Algorithm?

ans: Advantages of Booth Algorithm:

- Booth algorithm handles both positive and negative multipliers efficiently and reduces the number of arithmetic operations.

2. Write the algorithm for restoring division.

ans: Algorithm for Restoring Division:

- Initialize remainder and divisor.
- Left shift dividend and remainder.
- Subtract divisor from remainder.
- If result is negative, restore remainder and set quotient bit to 0.
- If result is positive, keep it and set quotient bit to 1.
- Repeat for required bits.

3. Algorithm for Non-Restoring Division:

- Initialize remainder and divisor.
- Left shift and subtract divisor.
- If remainder is positive, set quotient bit to 1.
- If negative, set bit to 0 and add divisor in next step.
- Final correction if remainder is negative.

4. In floating point numbers when so you say that an underflow or overflow has occurred?

ans floating Point Underflow/Overflow:

- Underflow: Results is smaller than the smallest representable positive number.

- overflow: Result is larger than the maximum representable number.

### Sec-B

1. Generate bit Pair recoding of 11010.

ans Bit Pair Recoding of 11010

- Group bits: 011010 (prepend 0).

- Form Pairs: (01)(10)(10)

- Encoding:

- 01  $\rightarrow$  +1

- 10  $\rightarrow$  -1

- 10  $\rightarrow$  -1

- Recoding: [+1, -1, -1]

2. Using restoring division method, divide 8 by 3.

ans Restoring Division ( $8 \div 3$ ):

- Binary of 8: 1000, divisor 3: 0011

- Steps:

- Shift left and subtract

- Restore if negative

- Track quotient bits

- Result: Quotient = 2, Remainder = 2



## Sec - c

1. Using non-restoring division method, divide 8 by 3

ans Step-1: Convert to binary Dividend (8) = 1000

Divisor (3) = 0011

Use 5-bit representation: 8 = 01000, 3 = 00011

Step-2: Initialize:

• Quotient = 0, Remainder = 0

Step-3: Repeat for n-bits (4 in this case for 4-bit dividend)

• Cycle Steps:

a. left shift remainder and bring next bit from dividend.

b. Subtract divisor if previous remainder was positive, else add it

c. Based on result, set quotient bit:

- If remainder  $\geq 0 \rightarrow$  set quotient bit = 1

- If remainder  $< 0 \rightarrow$  set quotient bit = 0

• After 4 steps, apply final correction if remainder is negative (add divisor).

• Result:

• Quotient = 0010 (decimal 2)

• Remainder = 0010 (decimal 2)

2. Carryout multiplication of below two numbers using both algorithm.

ans: Booth's multiplication:  $(+13) \times (-6)$ :

•  $+13 = 01101$ ,  $-6 = 11010$  (in 5-bit  
2's comp.)

• Apply Booth's Steps:

- Initialize A, S, and P

- Perform operations based on bit

Pairs (P[1:0])

- shift and repeat

• Final result =  $-78$  (in 2's complement)