**Batch: Roll No.:**

**Experiment / assignment / tutorial No.\_\_\_\_\_\_\_**

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| --- |
| **TITLE :** To study and implement Restoring method of division |

**AIM :** The basis of algorithm is based on paper and pencil approach and the operation involves repetitive shifting with addition and subtraction. So the main aim is to depict the usual process in the form of an algorithm.

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**Expected OUTCOME of Experiment: CO 1**

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**Books/ Journals/ Websites referred:**

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, Fifth Edition, TataMcGraw-Hill.
2. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Eighth Edition, Pearson.

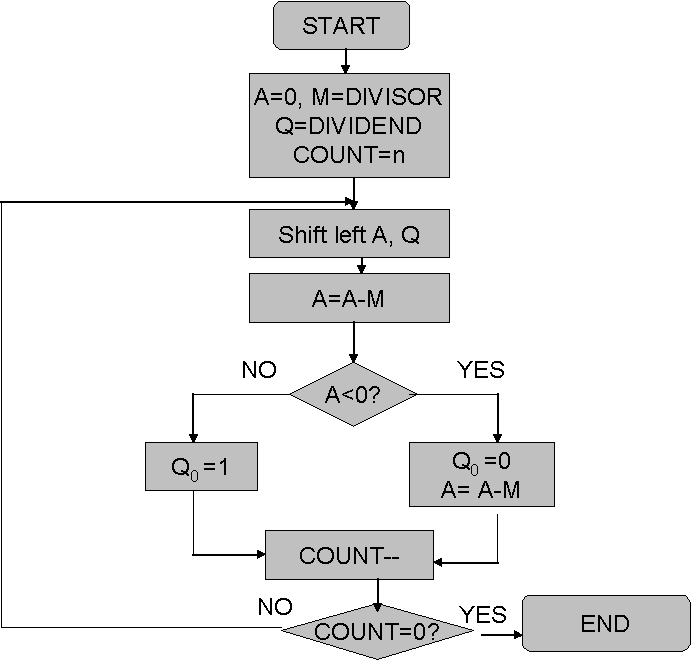
**3**. Dr. M. Usha, T. S. Srikanth, “Computer System Architecture and Organization”, First Edition, Wiley-India.

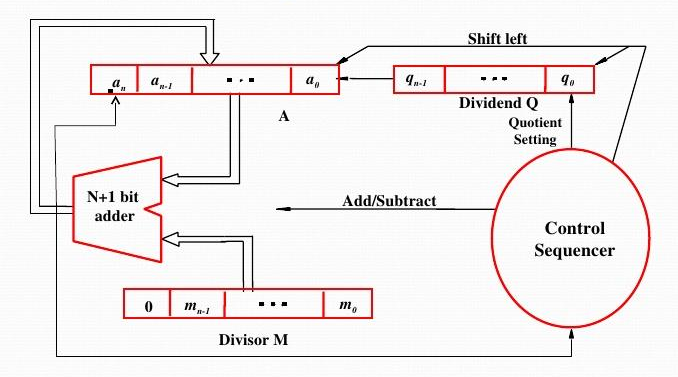
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**Pre Lab/ Prior Concepts:**

The Restoring algorithm works with any combination of positive and negative numbers

**Flowchart for Restoring of Division:**



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**Circuit Arrangement for Binary Division**

**Design Steps**: ( This will take care of any combination of positive and negative numbers. These steps are slightly different than above flowchart)

1. Start
2. Initialize M=Divisor and Dividend in A & Q registers. Dividend must be expressed as a 2n-bit twos complement number. Count=n (no of bits in dividend)
3. Left shift A, Q by 1 bit position
4. If MSB of A and M are same i.e sign of both is same
5. Then A=A-M
6. Else A=A+M
7. If MSB of previous A and present A (after subtract/ add operation) are same { This means previous operation is successful}
8. Then Q0=1 & retain present A (after operation)
9. Else Q0=0 & restore previous A ( before operation){ Since previous operation is not successful}
10. Decrement count.
11. If count≠ 0 go to step 3
12. Stop / End
13. The remainder is in A. If dividend is negative then remainder is in 2’s complement form. If signs of the divisor and dividend were the same then quotient is in Q as it is, otherwise the correct quotient is the twos complement of Q.

**Example:- (Handwritten following examples need to be solved with status of registers A, Q & M in every cycle) Consider these are 5 bit signed numbers. Use above design steps.**

1. 11/3 B) 11/ (-3) C) (-11)/ 3 D) (-11)/ (-3)

**Post Lab Descriptive Question(s)**

1. **What are the advantages of restoring division over non restoring division?**

Along with these pages submit source code of your program and program output.

**Date: \_\_\_\_\_\_\_\_\_\_\_\_\_**