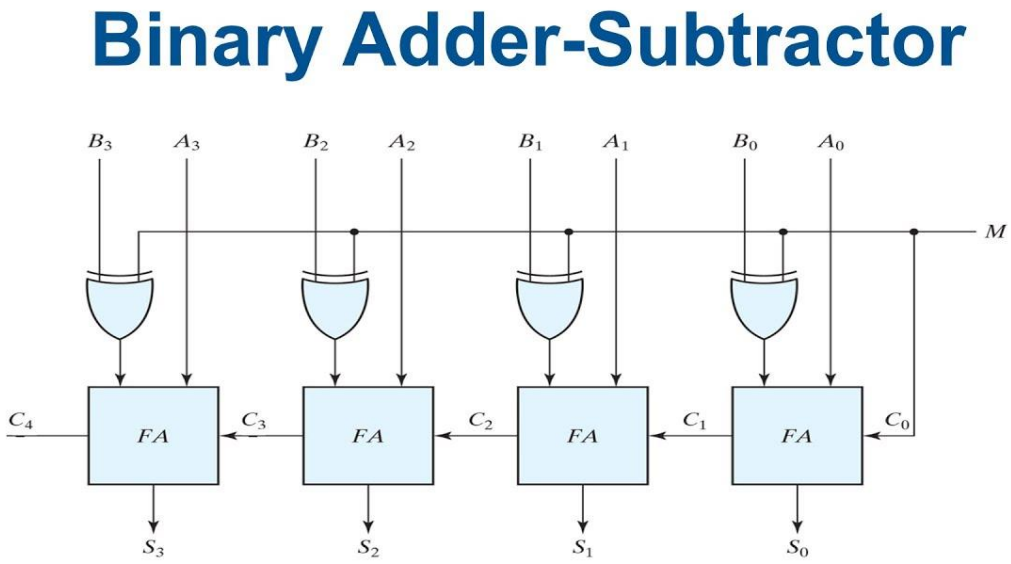
4-BIT ADDER \ SUBTRACTOR

In Digital Circuits, A **Binary Adder-Subtractor** is capable of both the addition and subtraction of binary numbers in one circuit itself. The operation is performed depending on the binary value the control signal holds. It is one of the components of the ALU (Arithmetic Logic Unit).
This Circuit Requires prerequisite knowledge of Exor Gate, Binary Addition and Subtraction, and Full Adder.



RTL CODE:

```
module FA(input a,b,cin, output sum,cout);
  assign sum = a^b^cin;
  assign cout = (a&b) | (b&cin) | (cin&a);
endmodule

module sub(input [3:0] a,b, input m,
                    output [3:0] sum, output cout);
```

```
  wire [2:0] w;
  FA f1(a[0],m^b[0],m,sum[0],w[0]);
  FA f2(a[1],m^b[1],w[0],sum[1],w[1]);
  FA f3(a[2],m^b[2],w[1],sum[2],w[2]);
  FA f4(a[3],m^b[3],w[2],sum[3],cout);

endmodule
```

TEST BENCH:

```
module testbench;
  reg [3:0]a,b;
  reg m;
  wire [3:0]sum;
  wire cout;
  sub b1(a,b,m,sum,cout);
  initial begin
    $dumpfile("dump.vcd");
    $dumpvars(1);
  end
  initial
    begin
      a=4'b1001;b=4'b1010;m=1'b1;
      #10 a=4'b1001;b=4'b1010;m=1'b0;
    end
  initial begin
```

```
    #30 $finish();
  end
endmodule
```