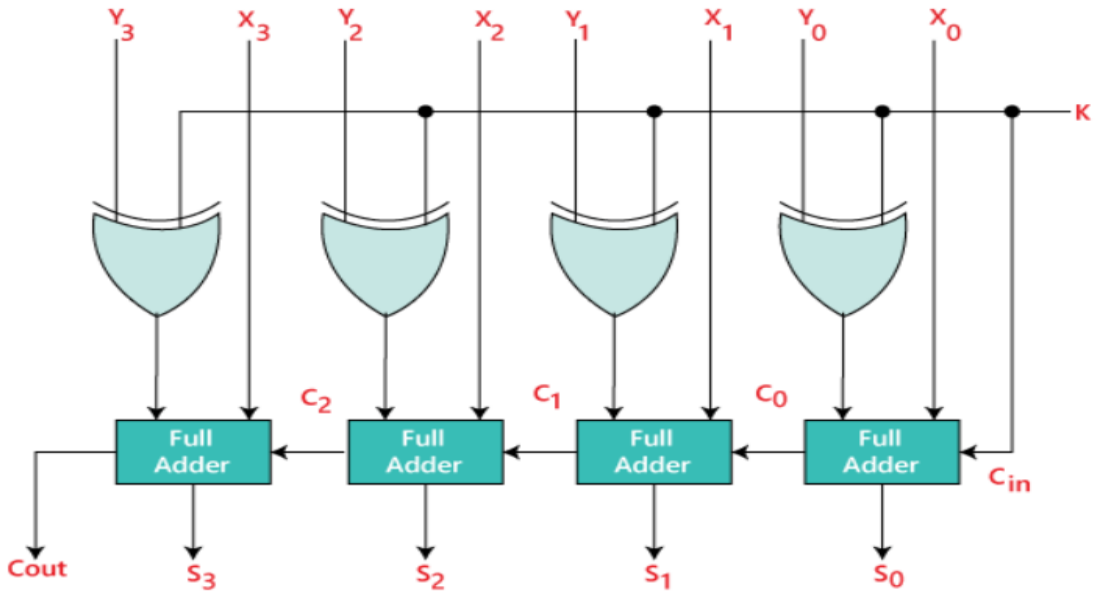
4 BIT PARALLEL ADDER \ SUBTRACTOR

A Binary Adder-Subtractor is a special type of circuit that is used to perform both operations, i.e., Addition and Subtraction. The operation which is going to be used depends on the values contained by the control signal. In Arithmetic Logical Unit, it is one of the most important components.

To work with Binary Adder-Subtractor, it is required that we have knowledge of the XOR gate, Full-Adder, Binary Addition, and subtraction



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 fl(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'b0001; b=4'b0011; m=1'b1;
    #20 a=4'b1011; b=4'b1100; m=1'b0;
```

```
  end
  initial
    begin
    #60 $finish();
  end
endmodule
```