1

| A | B | C | D | A' | B' | C' | D' | A · B · C · D' | (B · C · D)' | A · (B · C · D)' | (A + B + C + D) | A · B · C · D' + A · (B · C · D)' + (A + B + C + D)' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

AB

| CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 | 0 | 1 | 1 |
| 01 | 0 | 0 | 1 | 1 |
| 11 | 0 | 0 | 0 | 1 |
| 10 | 0 | 0 | 1 | 1 |

Y=B'C'D'+AC'+AB'+ACD'

| A | B | C | D | Y |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | x | x | x | 0 |
| 1 | x | x | x | 1 |
| 1 | 1 | 1 | 1 | 0 |

2

| A | B | C | A' | B' | C' | | | A' · B · C | B · C' | (B · C')' | B · C | A' · B · C + (B · C')' + B · C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 1 | | | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | | | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | | | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | | | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | | | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | | | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | | | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | | | 0 | 0 | 1 | 1 | 1 |

AB

| C | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Y=C+B'

| A | B | C | Y |
|---|---|---|---|
| 0 | 0 | x | 1 |
| x | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | x | 1 |
| 1 | 1 | 1 | 1 |

3

| A | B | C | D | A' | B' | C' | D' | A + B + C | (A + B + C)' | (A + B + C)' · D | A · D | Y= (A + B + C)' · D + A · D + B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

AB

| CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 1 | 0 |
| 01 | 1 | 1 | 1 | 1 |
| 11 | 0 | 1 | 1 | 1 |
| 10 | 0 | 1 | 1 | 0 |

Y= B+C'D+AB'D

| A | B | C | D | Y |
|---|---|---|---|---|
| 0 | 0 | x | x | 0 |
| 0 | x | 0 | x | 1 |
| 0 | 1 | 1 | x | 1 |
| 1 | 0 | x | 0 | 0 |
| 1 | x | x | x | 1 |

4

| A | B | C | A' | B' | C' | B · C | A' · B' · C' | B · C' | | B · C + A' · B' · C' + B · C' |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | 1 |

AB

| C | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 |

Y= B+A'C'

| A | B | C | Y |
|---|---|---|---|
| 0 | x | x | 1 |
| 0 | 0 | 1 | 0 |
| 1 | 0 | x | 0 |
| 1 | 1 | x | 1 |

```
//Diego Alejandro Mendez
//Carnet 19673
//Ejercicio 04
module E1_1GL(input wire A, B, C, output wire Y1);
//ejercicio 1.1 con GateLevel Modeling

  wire outAN, outBN, outCN, out01, out02, out03, out04;

//not's
  not U1 (outAN,A);
  not U2 (outBN,B);
  not U3 (outCN,C);

//compuertas

  and U4 (out01, outAN, outCN);
  and U5 (out02, A, C);
  and U6 (out03, A, outBN);
  or U7 (Y1, out01, out02, out03);
endmodule

module E1_2GL(input wire A, B, C, output wire Y2);
//ejercicio 1.2 con GateLevel Modeling

  wire outAN, outBN, outCN, out01, out02, out03, out04;

//not's
  not U2 (Y2,B);

endmodule

module E1_3OP(input wire A, B, C, D, output wire Y3);
//ejercicio 1.3 con operadores
  assign Y3 = (~A & ~B & ~C & ~D) | (~A & ~B & C & D) | (~A & B & ~C & D) | (~A & B & C & ~D) | (A & B & ~C & ~D) | (A & B & C & D) | (A & ~B & ~C & D) | (A & ~B & C & ~D);

endmodule

module E1_4GL (input wire A, B, C, D, output wire Y4);
  //Ejercicio 1.4 con GateLevel Modeling

  wire outAN, outBN, outCN, outDN, out01, out02, out03, out04;
  //not's
    not U1 (outAN,A);
    not U2 (outBN,B);
    not U3 (outCN,C);
    not U4 (outDN,D);

  //compuertas

  and U5(out01, A, B);
  and U6(out02, A, outCN, outDN);
  and U7(out03, A, B, C);
  or U8(Y4, out01, out02, out03);
endmodule //E1_4

module E2_1OP (input wire A, B, C, D, output wire Y5);
//Ejercicio 2.1  con operadores
  assign Y5 = (~B & ~C & ~D) | (A & ~C) | (A & ~B) | (A & C & ~D);

endmodule // E2_1OP


module E2_2GL (input A, B, C, output wire Y6);
//Ejercicio 2.2 con GateLevel Modeling

  //Not's
  not U1 (outAN,A);
  not U2 (outBN,B);
  not U3 (outCN,C);

  //compuertas
  or U5 (Y6, C, outBN);

endmodule // E2_2GL

module E2_3OP (input A, B, C, D, output wire Y7);

  assign Y7= (B) | (~C & D) | (A & ~B & D);

endmodule // E2_3OP

module E2_4OP (input A, B, C, output wire Y8);

  assign Y8 = (B) | (~A & ~C);

endmodule // E2_4OP
```

```
//Diego Alejandro Mendez
//Carnet 19673
//Ejercicio 05
module testbench();
// registrar entradas
  reg inA1, inB1, inC1;
  reg inA2, inB2, inC2;
  reg inA3, inB3, inC3, inD3;
  reg inA4, inB4, inC4, inD4;
  reg inA5, inB5, inC5, inD5;
  reg inA6, inB6, inC6;
  reg inA7, inB7, inC7, inD7;
  reg inA8, inB8, inC8;


  wire Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8;

  E1_1GL E1(inA1, inB1, inC1, Y1);
  E1_2GL E2(inA2, inB2, inC2, Y2);
  E1_3OP E3(inA3, inB3, inC3, inD3, Y3);
  E1_4GL E4(inA4, inB4, inC4, inD4, Y4);
  E2_1OP E5(inA5, inB5, inC5, inD5, Y5);
  E2_2GL E6(inA6, inB6, inC6, Y6);
  E2_3OP E7(inA7, inB7, inC7, inD7, Y7);
  E2_4OP E8(inA8, inB8, inC8, Y8);

  initial begin
    $display(" ");          //iniciamos el módulo Ej1.1
    $display("EJERCICIO 1.1");
    $display("A B C | Y");
    $display("----------");
    $monitor("%b %b %b  %b",inA1,inB1,inC1,Y1);
       inA1=0; inB1=0; inC1=0;
    #1 inA1=0; inB1=0; inC1=1;
    #1 inA1=0; inB1=1; inC1=0;
    #1 inA1=0; inB1=1; inC1=1;
    #1 inA1=1; inB1=0; inC1=0;
    #1 inA1=1; inB1=0; inC1=1;
    #1 inA1=1; inB1=1; inC1=0;
    #1 inA1=1; inB1=1; inC1=1;
    end

  initial begin                //iniciamos el módulo Ej1.2
    #9
    $display("");
```

```
initial begin                //iniciamos el módulo Ej1.2
  #9
  $display("");
  $display("EJERCICIO 1.2");
  $display("A B C | Y");
  $display("----------");
  $monitor("%b %b %b  %b",inA2,inB2,inC2,Y2);
     inA2=0; inB2=0; inC2=0;
  #1 inA2=0; inB2=0; inC2=1;
  #1 inA2=0; inB2=1; inC2=0;
  #1 inA2=0; inB2=1; inC2=1;
  #1 inA2=1; inB2=0; inC2=0;
  #1 inA2=1; inB2=0; inC2=1;
  #1 inA2=1; inB2=1; inC2=0;
  #1 inA2=1; inB2=1; inC2=1;
  end

initial begin
  #18
    $display(" ");          //iniciamos el módulo Ej1.3
    $display("EJERCICIO 1.3");
    $display("A B C D | Y");
    $display("----------");
    $monitor("%b %b %b %b  %b",inA3,inB3,inC3,inD3,Y3);
      inA3=0; inB3=0; inC3=0; inD3=0;
    #1 inA3=0; inB3=0; inC3=0; inD3=1;
    #1 inA3=0; inB3=0; inC3=1; inD3=0;
    #1 inA3=0; inB3=0; inC3=1; inD3=1;
    #1 inA3=0; inB3=1; inC3=0; inD3=0;
    #1 inA3=0; inB3=1; inC3=0; inD3=1;
    #1 inA3=0; inB3=1; inC3=1; inD3=0;
    #1 inA3=0; inB3=1; inC3=1; inD3=1;
    #1 inA3=1; inB3=0; inC3=0; inD3=0;
    #1 inA3=1; inB3=0; inC3=0; inD3=1;
    #1 inA3=1; inB3=0; inC3=1; inD3=0;
    #1 inA3=1; inB3=0; inC3=1; inD3=1;
    #1 inA3=1; inB3=1; inC3=0; inD3=0;
    #1 inA3=1; inB3=1; inC3=0; inD3=1;
    #1 inA3=1; inB3=1; inC3=1; inD3=0;
    #1 inA3=1; inB3=1; inC3=1; inD3=1;
  end
```

```
initial begin
  #35
    $display(" ");          //iniciamos el módulo Ej1.4
    $display("EJERCICIO 1.4");
    $display("A B C D | Y");
    $display("----------");
    $monitor("%b %b %b %b  %b",inA4,inB4,inC4,inD4,Y4);
      inA4=0; inB4=0; inC4=0; inD4=0;
    #1 inA4=0; inB4=0; inC4=0; inD4=1;
    #1 inA4=0; inB4=0; inC4=1; inD4=0;
    #1 inA4=0; inB4=0; inC4=1; inD4=1;
    #1 inA4=0; inB4=1; inC4=0; inD4=0;
    #1 inA4=0; inB4=1; inC4=0; inD4=1;
    #1 inA4=0; inB4=1; inC4=1; inD4=0;
    #1 inA4=0; inB4=1; inC4=1; inD4=1;
    #1 inA4=1; inB4=0; inC4=0; inD4=0;
    #1 inA4=1; inB4=0; inC4=0; inD4=1;
    #1 inA4=1; inB4=0; inC4=1; inD4=0;
    #1 inA4=1; inB4=0; inC4=1; inD4=1;
    #1 inA4=1; inB4=1; inC4=0; inD4=0;
    #1 inA4=1; inB4=1; inC4=0; inD4=1;
    #1 inA4=1; inB4=1; inC4=1; inD4=0;
    #1 inA4=1; inB4=1; inC4=1; inD4=1;
  end

  initial begin
    #52
      $display(" ");          //iniciamos el módulo Ej2.1
      $display("EJERCICIO 2.1");
      $display("A B C D | Y");
      $display("----------");
      $monitor("%b %b %b %b  %b",inA5,inB5,inC5,inD5,Y5);
        inA5=0; inB5=0; inC5=0; inD5=0;
      #1 inA5=0; inB5=0; inC5=0; inD5=1;
      #1 inA5=0; inB5=0; inC5=1; inD5=0;
      #1 inA5=0; inB5=0; inC5=1; inD5=1;
      #1 inA5=0; inB5=1; inC5=0; inD5=0;
      #1 inA5=0; inB5=1; inC5=0; inD5=1;
      #1 inA5=0; inB5=1; inC5=1; inD5=0;
      #1 inA5=0; inB5=1; inC5=1; inD5=1;
      #1 inA5=1; inB5=0; inC5=0; inD5=0;
      #1 inA5=1; inB5=0; inC5=0; inD5=1;
      #1 inA5=1; inB5=0; inC5=1; inD5=0;
      #1 inA5=1; inB5=0; inC5=1; inD5=1;
      #1 inA5=1; inB5=1; inC5=0; inD5=0;
```

```
  #1 inA5=1; inB5=1; inC5=1; inD5=0;
  #1 inA5=1; inB5=1; inC5=1; inD5=1;
end

initial begin
  #70
    $display(" ");          //iniciamos el módulo Ej2.2
    $display("EJERCICIO 2.2");
    $display("A B C | Y");
    $display("----------");
    $monitor("%b %b %b   %b",inA6,inB6,inC6,Y6);
    inA6=0; inB6=0; inC6=0;
 #1 inA6=0; inB6=0; inC6=1;
 #1 inA6=0; inB6=1; inC6=0;
 #1 inA6=0; inB6=1; inC6=1;
 #1 inA6=1; inB6=0; inC6=0;
 #1 inA6=1; inB6=0; inC6=1;
 #1 inA6=1; inB6=1; inC6=0;
 #1 inA6=1; inB6=1; inC6=1;
  end

initial begin
  #87
    $display(" ");          //iniciamos el módulo Ej2.3
    $display("EJERCICIO 2.3");
    $display("A B C D | Y");
    $display("----------");
    $monitor("%b %b %b %b  %b",inA7, inB7, inC7, inD7,Y7);
      inA7=0; inB7=0; inC7=0; inD7=0;
    #1 inA7=0; inB7=0; inC7=0; inD7=1;
    #1 inA7=0; inB7=0; inC7=1; inD7=0;
    #1 inA7=0; inB7=0; inC7=1; inD7=1;
    #1 inA7=0; inB7=1; inC7=0; inD7=0;
    #1 inA7=0; inB7=1; inC7=0; inD7=1;
    #1 inA7=0; inB7=1; inC7=1; inD7=0;
    #1 inA7=0; inB7=1; inC7=1; inD7=1;
    #1 inA7=1; inB7=0; inC7=0; inD7=0;
    #1 inA7=1; inB7=0; inC7=0; inD7=1;
    #1 inA7=1; inB7=0; inC7=1; inD7=0;
    #1 inA7=1; inB7=0; inC7=1; inD7=1;
    #1 inA7=1; inB7=1; inC7=0; inD7=0;
    #1 inA7=1; inB7=1; inC7=0; inD7=1;
    #1 inA7=1; inB7=1; inC7=1; inD7=0;
    #1 inA7=1; inB7=1; inC7=1; inD7=1;
  end
```

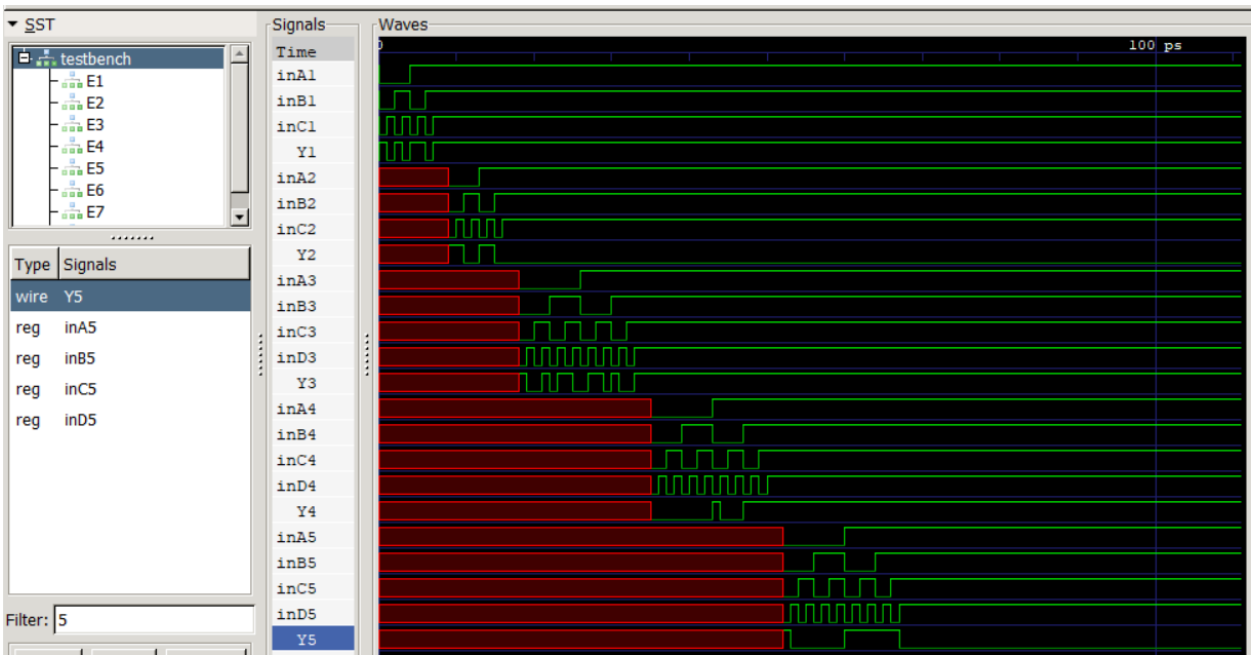
```
      initial begin
        #104
            $display(" ");          //iniciamos el módulo Ej2.4
            $display("EJERCICIO 2.4");
            $display("A B C | Y");
            $display("----------");
            $monitor("%b %b %b   %b",inA8, inB8, inC8, Y8);
            inA8=0; inB8=0; inC8=0;
         #1 inA8=0; inB8=0; inC8=1;
         #1 inA8=0; inB8=1; inC8=0;
         #1 inA8=0; inB8=1; inC8=1;
         #1 inA8=1; inB8=0; inC8=0;
         #1 inA8=1; inB8=0; inC8=1;
         #1 inA8=1; inB8=1; inC8=0;
         #1 inA8=1; inB8=1; inC8=1;
        end
initial
#125 $finish;

initial begin

    $dumpfile("ejercicios_tb.vcd");
    $dumpvars(0,testbench);
end

endmodule
```

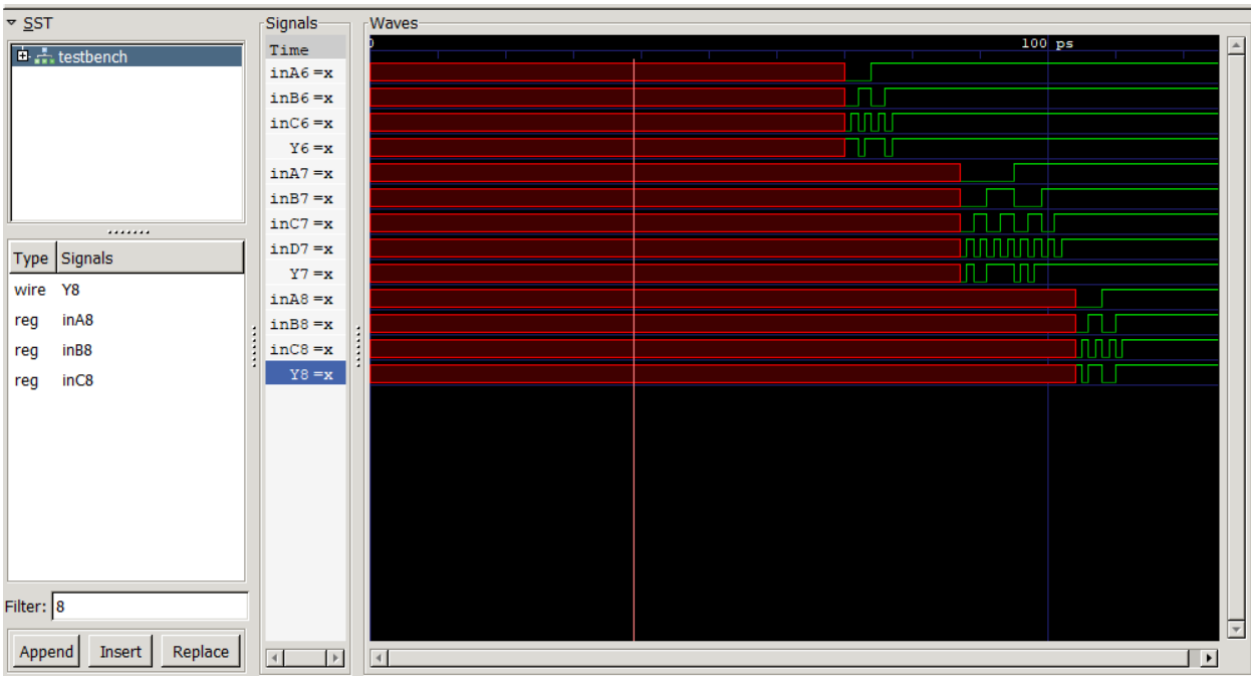
```
EJERCICIO 1.1
A B C | Y
----------
VCD info: dumpfile
0 0 0  1
0 0 1  0
0 1 0  1
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1

EJERCICIO 1.2
A B C | Y
----------
0 0 0  1
0 0 1  1
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  0
```

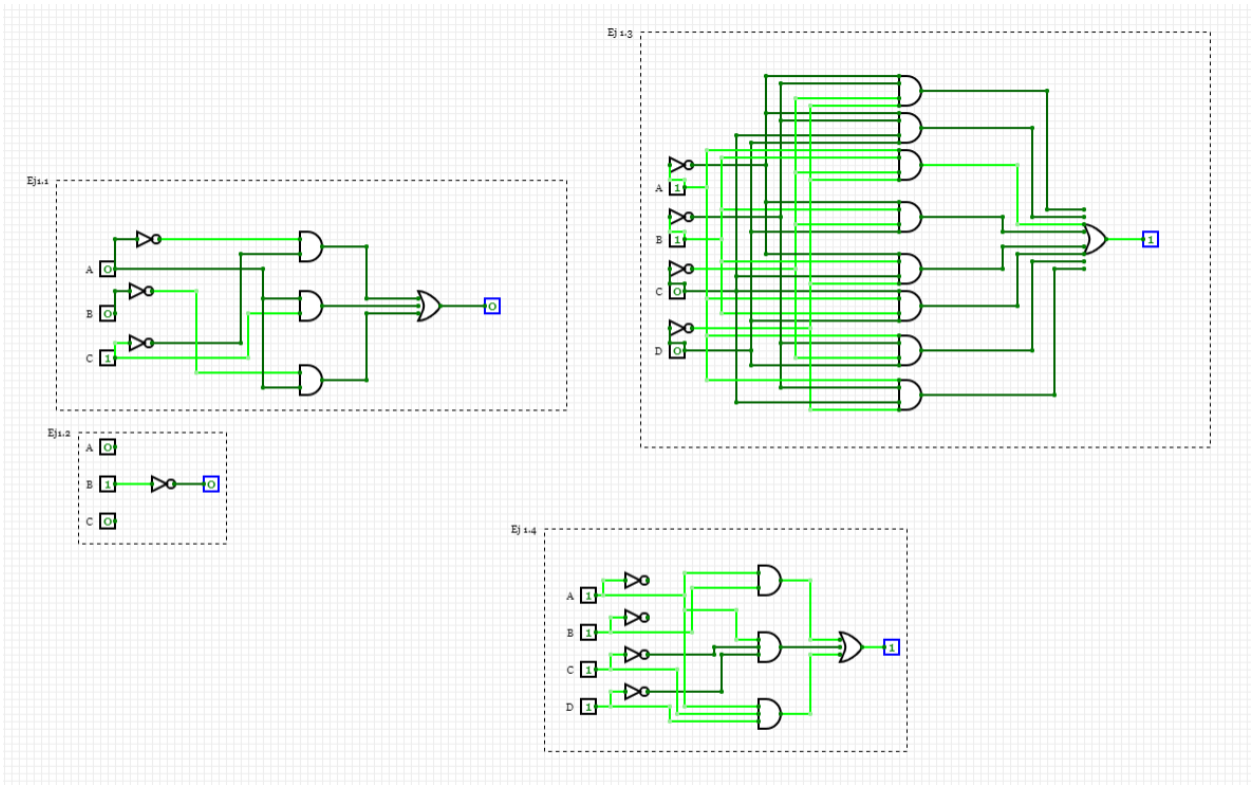
```
EJERCICIO 1.3
A B C D | Y
---------
0 0 0 0  1
0 0 0 1  0
0 0 1 0  0
0 0 1 1  1
0 1 0 0  0
0 1 0 1  1
0 1 1 0  1
0 1 1 1  0
1 0 0 0  0
1 0 0 1  1
1 0 1 0  1
1 0 1 1  0
1 1 0 0  1
1 1 0 1  0
1 1 1 0  0
1 1 1 1  1

EJERCICIO 1.4
A B C D | Y
---------
0 0 0 0  0
0 0 0 1  0
0 0 1 0  0
0 0 1 1  0
0 1 0 0  0
0 1 0 1  0
0 1 1 0  0
0 1 1 1  0
1 0 0 0  1
1 0 0 1  0
1 0 1 0  0
1 0 1 1  0
1 1 0 0  1
1 1 0 1  1
1 1 1 0  1
```

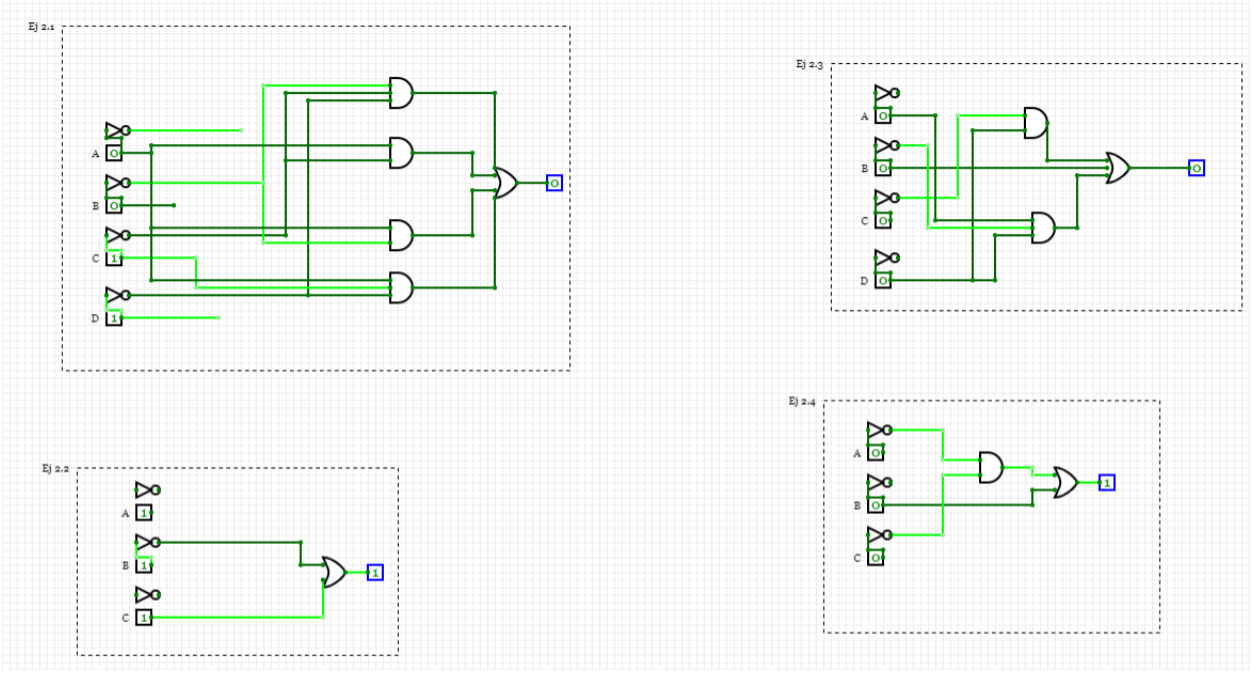
```
EJERCICIO 2.1
A B C D | Y
---------
0 0 0 0  1
0 0 0 1  0
0 0 1 0  0
0 0 1 1  0
0 1 0 0  0
0 1 0 1  0
0 1 1 0  0
0 1 1 1  0
1 0 0 0  1
1 0 0 1  1
1 0 1 0  1
1 0 1 1  1
1 1 0 0  1
1 1 0 1  1
1 1 1 0  1
1 1 1 1  0

EJERCICIO 2.2
A B C | Y
---------
0 0 0   1
0 0 1   1
0 1 0   0
0 1 1   1
1 0 0   1
1 0 1   1
1 1 0   0
1 1 1   1
```

```
EJERCICIO 2.3
A B C D | Y
---------
0 0 0 0  0
0 0 0 1  1
0 0 1 0  0
0 0 1 1  0
0 1 0 0  1
0 1 0 1  1
0 1 1 0  1
0 1 1 1  1
1 0 0 0  0
1 0 0 1  1
1 0 1 0  0
1 0 1 1  1
1 1 0 0  1
1 1 0 1  1
1 1 1 0  1
1 1 1 1  1

EJERCICIO 2.4
A B C | Y
---------
0 0 0   1
0 0 1   0
0 1 0   1
0 1 1   1
1 0 0   0
1 0 1   0
1 1 0   1
1 1 1   1
```




SST
testbench
Type
Signals
wire Y8
reg inA8
reg inB8
reg inC8
Filter: 8
Append
Insert
Replace
Signals
Time
inA6 =x
inB6 =x
inC6 =x
Y6 =x
inA7 =x
inB7 =x
inC7 =x
inD7 =x
Y7 =x
inA8 =x
inB8 =x
inC8 =x
Y8 =x
Waves
100 ps


Ej1.1
Ej1.2
Ej1.3
Ej1.4




Ejercicio 5

| A | B | C | Y |
|---|---|---|---|
| Armado | Ventana | Movimiento | Alarma y Luces |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

POS (A+B+C)(A+B+C')(A+B'+C)(A+B'+C')(A'+B'+C)

SOP (AB'C')+(AB'C)+(ABC)

| | AB | | | |
|---|---|---|---|---|
| C | 00 | 01 | 11 | 10 |
| 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |

Y=AC+AB'

| A | B | C | Y |
|---|---|---|---|
| Armado | Ventana | Movimiento | Alarma y Luces |
| 0 | x | x | 0 |
| 1 | 0 | x | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

```
//Diego Alejandro Mendez
//Carnet 19673
//Ejercicio 05

module MK_GL(input wire A,B,C, output wire Y);
//Mapa Karnaugh con Gate Modeling

  wire out01, out02, out03, out04, out05, AN, BN, CN;

//Not's
  not U1(AN,A);
  not U2(BN,B);
  not U3(CN,C);

//Compuerta
  and U4(out01,A,C);
  and U5(out02,A,BN);
  or U6(Y, out01, out02);

endmodule //MK_GL

module MK_OP(input wire A,B,C, output wire Y);
//Mapa de Karnaugh con Operadores

  assign Y= (A & C) | (A & ~B);

endmodule //MK_OP

module SOP_GL(input wire A,B,C, output wire Y);
//SOP con Gate Modeling

wire out01, out02, out03, out04, out05, AN, BN, CN;

//Not's
  not U1(AN,A);
  not U2(BN,B);
  not U3(CN,C);

//Compuerta
  and U4(out01,A,BN,CN);
  and U5(out02,A,BN,C);
  and U6(out03,A,B,C);
  or U6(Y, out01, out02, out03);

endmodule // SOP_GL
```

```
module SOP_OP (input wire A,B,C, output wire Y);
//SOP  con Operadores

  assign Y = (A & ~B & ~C) | (A & ~B & C) | (A & B & C);

endmodule // SOP_OP

module POS_GL (input wire A,B,C, output wire Y);
//POS con Gate
  wire out01, out02, out03, out04, out05, AN, BN, CN;

//Not's
  not U1(AN,A);
  not U2(BN,B);
  not U3(CN,C);

//Compuerta
  or U4(out01,A,B,C);
  or U5(out02,A,B,CN);
  or U6(out03,A,BN,C);
  or U6(out04,A,BN,CN);
  or U7(out05,AN,BN,C);
  and U8(Y,out01, out02, out03, out04, out05);

endmodule //POS_GL

module POS_OP (input wire A,B,C, output wire Y);
//POS con Operadores

  assign Y = (A | B | C) & (A | B | ~C) & (A | ~B | C) & (A | ~B | ~C) & (~A | ~B | C);

endmodule //POS_OP
```

```
//Diego Alejandro Mendez
//Carnet 19673
//Ejercicio 05

module testbench();
// registrar entradas
  reg inA1, inB1, inC1;
  reg inA2, inB2, inC2;
  reg inA3, inB3, inC3;
  reg inA4, inB4, inC4;
  reg inA5, inB5, inC5;
  reg inA6, inB6, inC6;

  wire Y1, Y2, Y3, Y4, Y5, Y6;

  MK_GL U1(inA1, inB1, inC1, Y1);
  MK_OP U2(inA2, inB2, inC2, Y2);
  SOP_GL U3(inA3, inB3, inC3, Y3);
  SOP_OP U4(inA4, inB4, inC4, Y4);
  POS_GL U5(inA5, inB5, inC5, Y5);
  POS_OP U6(inA6, inB6, inC6, Y6);


  initial begin //iniciamos el módulo MK_GL
    $display(" ");
    $display("Mapa Karnaugh de Gate Modeling");
    $display("A B C | Y");
    $display("----------");
    $monitor("%b %b %b  %b",inA1,inB1,inC1,Y1);
       inA1=0; inB1=0; inC1=0;
    #1 inA1=0; inB1=0; inC1=1;
    #1 inA1=0; inB1=1; inC1=0;
    #1 inA1=0; inB1=1; inC1=1;
    #1 inA1=1; inB1=0; inC1=0;
    #1 inA1=1; inB1=0; inC1=1;
    #1 inA1=1; inB1=1; inC1=0;
    #1 inA1=1; inB1=1; inC1=1;
    end
```

```
initial begin   //iniciamos el módulo MK_OP
  #9
  $display("");
  $display("Mapa Karnaugh de Operadores");
  $display("A B C | Y");
  $display("----------");
  $monitor("%b %b %b  %b",inA2,inB2,inC2,Y2);
     inA2=0; inB2=0; inC2=0;
  #1 inA2=0; inB2=0; inC2=1;
  #1 inA2=0; inB2=1; inC2=0;
  #1 inA2=0; inB2=1; inC2=1;
  #1 inA2=1; inB2=0; inC2=0;
  #1 inA2=1; inB2=0; inC2=1;
  #1 inA2=1; inB2=1; inC2=0;
  #1 inA2=1; inB2=1; inC2=1;
  end

initial begin
  #18
  $display(" ");         //iniciamos el módulo SOP_GL
  $display("SOP con Gate Modeling");
  $display("A B C  | Y");
  $display("----------");
  $monitor("%b %b %b  %b",inA3,inB3,inC3,Y3);
    inA3=0; inB3=0; inC3=0;
  #1 inA3=0; inB3=0; inC3=1;
  #1 inA3=0; inB3=1; inC3=0;
  #1 inA3=0; inB3=1; inC3=1;
  #1 inA3=1; inB3=0; inC3=0;
  #1 inA3=1; inB3=0; inC3=1;
  #1 inA3=1; inB3=1; inC3=0;
  #1 inA3=1; inB3=1; inC3=1;
  end
```

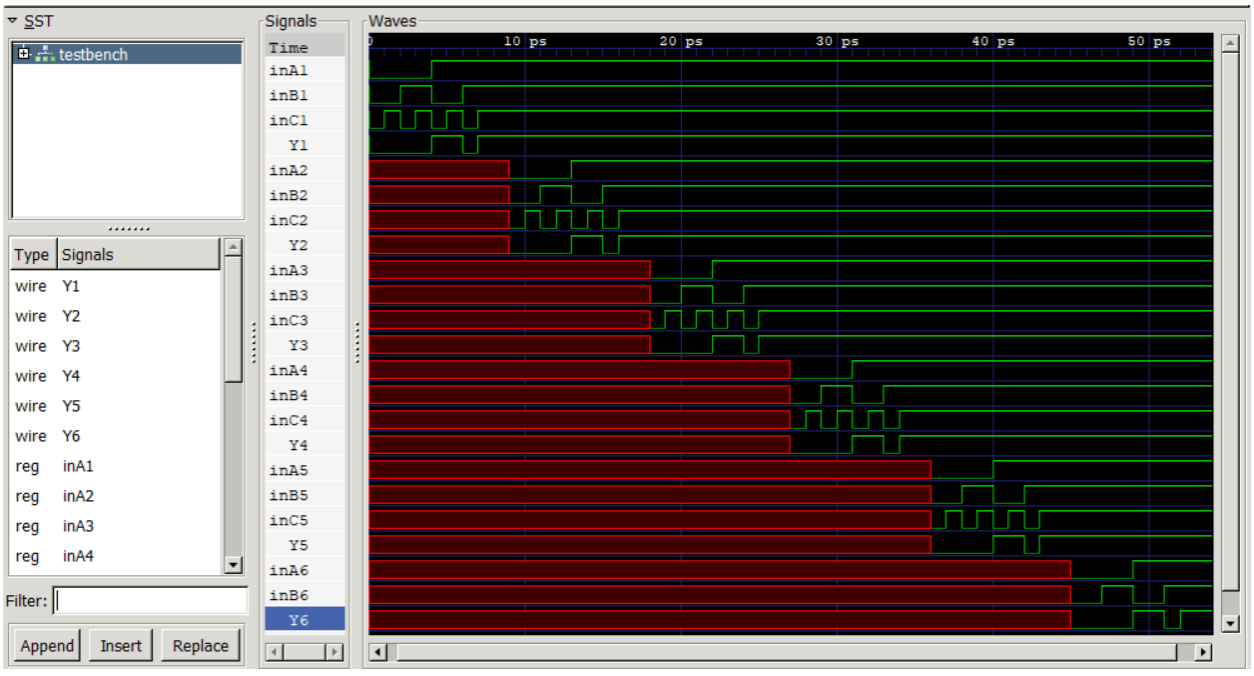
```
initial begin           //iniciamos el SOP con Operadores
  #27
    $display(" ");
    $display("SOP con Operadores");
    $display("A B C | Y");
    $display("----------");
    $monitor("%b %b %b  %b",inA4,inB4,inC4,Y4);
      inA4=0; inB4=0; inC4=0;
    #1 inA4=0; inB4=0; inC4=1;
    #1 inA4=0; inB4=1; inC4=0;
    #1 inA4=0; inB4=1; inC4=1;
    #1 inA4=1; inB4=0; inC4=0;
    #1 inA4=1; inB4=0; inC4=1;
    #1 inA4=1; inB4=1; inC4=0;
    #1 inA4=1; inB4=1; inC4=1;
  end

  initial begin           //iniciamos el POS con Gate Modeling
    #36
      $display(" ");
      $display("POS con Gate Modeling");
      $display("A B C | Y");
      $display("----------");
      $monitor("%b %b %b  %b",inA5,inB5,inC5,Y5);
        inA5=0; inB5=0; inC5=0;
      #1 inA5=0; inB5=0; inC5=1;
      #1 inA5=0; inB5=1; inC5=0;
      #1 inA5=0; inB5=1; inC5=1;
      #1 inA5=1; inB5=0; inC5=0;
      #1 inA5=1; inB5=0; inC5=1;
      #1 inA5=1; inB5=1; inC5=0;
      #1 inA5=1; inB5=1; inC5=1;
    end
```

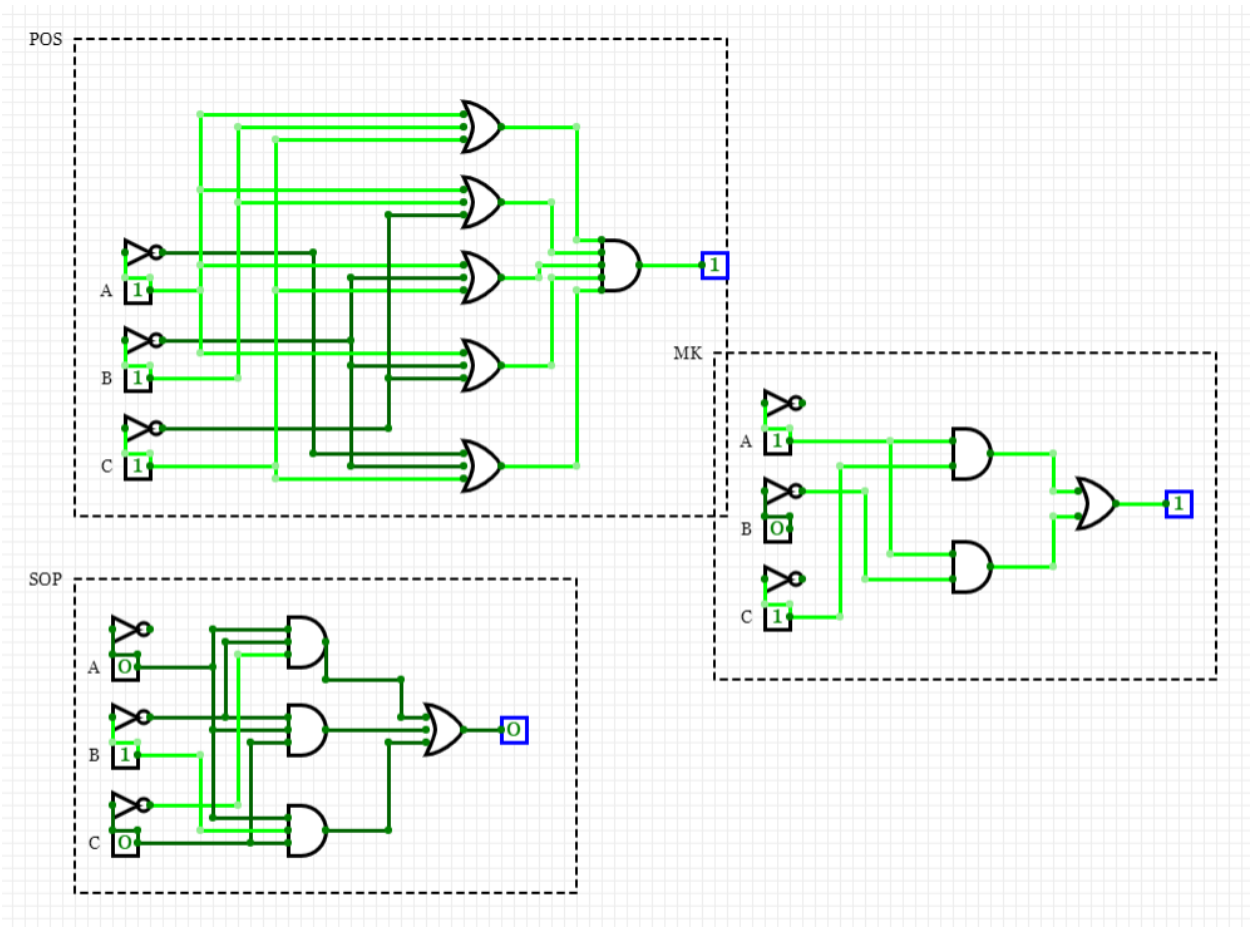
```
    initial begin
      #45
        $display(" ");          //iniciamos el módulo POS con Operadores
        $display("POS con Operadores");
        $display("A B C | Y");
        $display("----------");
        $monitor("%b %b %b   %b",inA6,inB6,inC6,Y6);
        inA6=0; inB6=0; inC6=0;
     #1 inA6=0; inB6=0; inC6=1;
     #1 inA6=0; inB6=1; inC6=0;
     #1 inA6=0; inB6=1; inC6=1;
     #1 inA6=1; inB6=0; inC6=0;
     #1 inA6=1; inB6=0; inC6=1;
     #1 inA6=1; inB6=1; inC6=0;
     #1 inA6=1; inB6=1; inC6=1;
      end

initial
#54 $finish;

initial begin

    $dumpfile("Ejercicio_tb.vcd");
    $dumpvars(0,testbench);
end

endmodule
```

```
Mapa Karnaugh de Gate Modeling
A B C | Y
----------
VCD info: dumpfile Ejercicio_tb.
0 0 0  0
0 0 1  0
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1

Mapa Karnaugh de Operadores
A B C | Y
----------
0 0 0  0
0 0 1  0
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1
```

```
SOP con Gate Modeling
A B C  | Y
----------
0 0 0  0
0 0 1  0
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1

SOP con Operadores
A B C | Y
----------
0 0 0  0
0 0 1  0
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1
```

```
POS con Gate Modeling
A B C | Y
----------
0 0 0  0
0 0 1  0
0 1 0  0
0 1 1  0
1 0 0  1
1 0 1  1
1 1 0  0
1 1 1  1

POS con Operadores
A B C | Y
----------
0 0 0   0
0 0 1   0
0 1 0   0
0 1 1   0
1 0 0   1
1 0 1   1
1 1 0   0
1 1 1   1
```




POS
A
1
B
1
C
1
1
MK
A
1
B
0
C
1
1
SOP
A
0
B
1
C
0
0