

HW2 CE303

P1:

	col1	col2	col3	col4	col5
row1	1	1	0	1	0
row2	1	0	1	0	1
row3	1	0	0	1	0
row4	0	1	1	1	0
row5	0	1	0	1	1
row6	1	0	1	1	0

Col4 dominates Col2 so Col2 is removed

	col1	col3	col4	col5
row1	1	0	1	0
row2	1	1	0	1
row3	1	0	1	0
row4	0	1	1	0
row5	0	0	1	1
row6	1	1	1	0

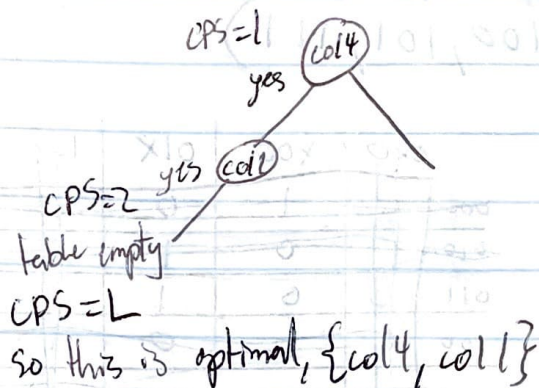
Row 3 dominates Row 1 so Row 1 is removed

Row 6 dominates Row 4 so Row 4 is removed

	col1	col3	col4	col5
Row2	1	0	1	0
Row5	1	1	0	1
Row6	0	1	1	0
Row5	0	0	1	1

This is
the cyclic
core so we
branch & bound

Branch & Bound $U=5$
 $L=2$



Col1 Col3 Col5
Row2 1 1 1

All dominate each other
so all equal

P2:

(i) $S(0000, 0101, 0110, 1010, 1011, 1101)$ $d(0100, 1000, 1110)$

	col1	col2	col3
✓ 0000	0-00	-000	
✓ 0100	010-	01-0	
✓ 1000	010-	01-0	
✓ 0101	010-	01-0	
✓ 0110	010-	01-0	
✓ 1010	-101	-110	
✓ 1011	-101	-110	
✓ 1101	101-	1-10	
✓ 1110	101-	1-10	

Prime implicants

	0x00	x000	010x	01x0	10x0	x101	x110	101x	110x
0000	1	1	0	0	0	0	0	0	0
0101	0	0	1	0	0	1	0	0	0
0110	0	0	0	1	0	0	1	0	0
1010	0	0	0	0	1	0	0	1	0
1011	0	0	0	0	1	0	0	1	0
1101	0	0	0	0	0	1	1	0	0
1110	0	0	0	0	0	1	1	0	0

101x is essential
x101 is essential

0x00 dominates x000, 01x0 dominates x110

→ Use 101x, x101, 0x00, 01x0

→ $f(a,b,c,d) = \bar{a}bc + b\bar{c}d + \bar{a}c\bar{d} + \bar{a}b\bar{d}$

P2:

(2) $S(000, 010, 011, 100, 101, 111)$

col 1	col 2	col 3
✓ 000	0-0	
✓ 010	-00	
✓ 100		
✓ 011	01-	
✓ 101	10-	
✓ 111	-11	
	1-1	

	0x0	x00	01x	10x	x11	1x1
000	1	1	0	0	0	0
010	1	0	1	0	0	0
011	0	0	1	0	1	0
100	0	1	0	1	0	0
101	0	0	0	1	0	1
111	0	0	0	0	1	1

Prime implicants

$U=7$
 $L=3$

Branch & Bound

	x00	01x	10x	x11	1x1
011	0	1	0	1	0
100	1	0	1	0	0
101	0	0	1	0	1
111	0	0	0	1	1

x11 dominates 1x1 & 01x

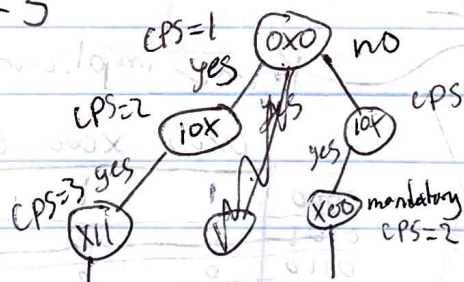


Table is empty & CPS = L so we found optimal solution

	x00	01x	x11	1x1
000	1	0	0	0
010	0	1	0	0
011	0	1	1	0
111	0	0	1	1

→ use 0x0, 10x, x11

$$f(a,b,c) = \bar{a}\bar{c} + a\bar{b} + bc$$

Problem 3:

	signed?	width	base	int val
8'b00001000	No	8	bin	8
16'hABCD	No	16	hex	43981
4'sb1110	Yes	4	bin	-2
4'd12	No	4	dec	12
4'b1100	No	4	bin	12
8'shFF	Yes	8	hex	-1
8'sb00011100	Yes	8	bin	28
12'h2A8	No	12	hex	680
6'sb111101	Yes	6	bin	-3
12'o3456	No	12	oct	1838

Problem 4:**alarm.v:**

```
`timescale 1ns/10ps
```

```
//top module
```

```
module alarm(PANIC, EN, EXIT, WINDOW, DOOR, GARAGE, ALARM);
```

```
    input  PANIC,EN,EXIT,WINDOW,DOOR,GARAGE;
```

```
    output ALARM;
```

```
    wire gate1,gate2,gate3;
```

```
    nand(gate1,WINDOW,DOOR,GARAGE);
```

```
    not(gate2,EXIT);
```

```
    and(gate3,EN,gate2,gate1);
```

```
    or(ALARM,gate3,PANIC);
```

```
endmodule
```

alarm_test.v:

```
`timescale 1ns/10ps

module alarm_test;

    reg PANIC,EN,EXIT,WINDOW,DOOR,GARAGE;

    wire ALARM;

    alarm doubile(
        PANIC,EN,EXIT,WINDOW,DOOR,GARAGE,ALARM
    );

    initial
    begin
        // first case - should be alarm = 1
        assign PANIC = 1;
        assign EN = 1;
        assign EXIT = 1;
        assign WINDOW = 1;
        assign DOOR = 1;
        assign GARAGE = 0;

        #20

        // second case - should be alarm = 0
        assign PANIC = 0;

        #20

        // third case - should be alarm = 1
        assign EXIT = 0;
```

```

#20

// fourth case - should be alarm = 0

assign EN = 0;

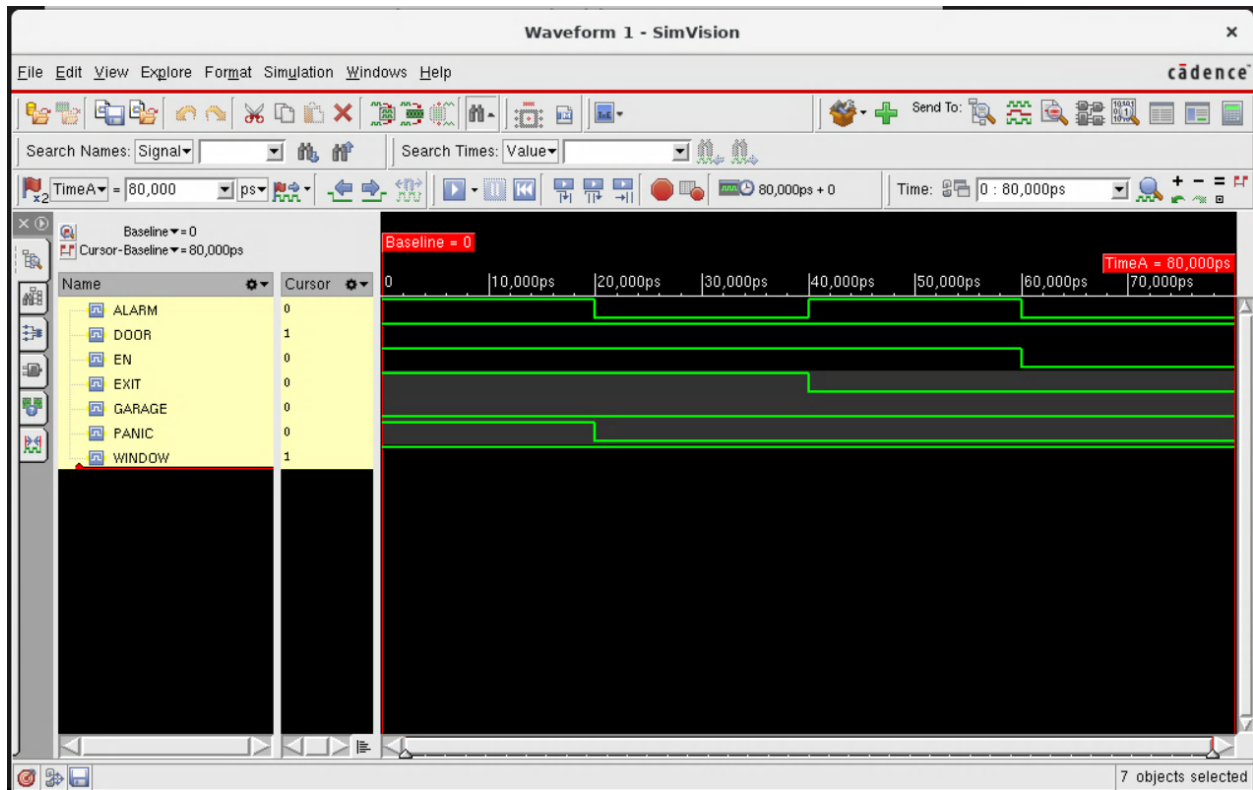
#20

$finish;

end

endmodule

```



Simulation output