2-bit comparator

```
`timescale 1ns / 1ps

module comparator_2bit(
input a0,a1,b0,b1,
output x,y,z );

assign x = (a0&~b0)|(a1&~b0&~b1)|(a0&a1&~b1);
assign y = (~a0&~a1&~b0&~b1)|(~a0&a1&~b0&b1)|(a0&a1&b0&b1)|(a0&~a1&b0&~b1);
assign z = (~a0&b0)+(~a0&~a1&b1)+(~a1&b0&b1);
endmodule
```

Testbench:

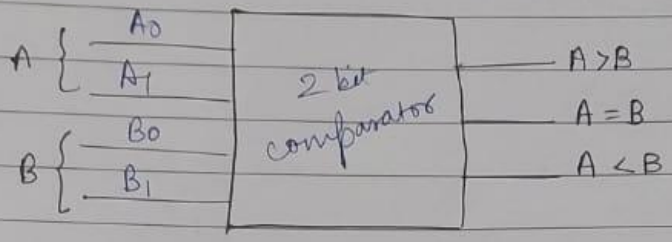
```
`timescale 1ns / 1ps

module comparator2bit_tb();
reg a0,a1,b0,b1;
wire x,y,z;

comparator_2bit uut(a0,a1,b0,b1,x,y,z);

initial begin
   a0 = 0; a1 = 0; b0 = 0; b1 = 0; #10;
   a0 = 0; a1 = 0; b0 = 0; b1 = 1; #10;
   a0 = 0; a1 = 0; b0 = 1; b1 = 0; #10;
   a0 = 0; a1 = 0; b0 = 1; b1 = 1; #10;
   a0 = 0; a1 = 1; b0 = 0; b1 = 0; #10;
   a0 = 0; a1 = 1; b0 = 0; b1 = 1; #10;
   a0 = 0; a1 = 1; b0 = 1; b1 = 0; #10;
   a0 = 0; a1 = 1; b0 = 1; b1 = 1; #10;
   a0 = 1; a1 = 0; b0 = 0; b1 = 0; #10;
   a0 = 1; a1 = 0; b0 = 0; b1 = 1; #10;
   a0 = 1; a1 = 0; b0 = 1; b1 = 0; #10;
   a0 = 1; a1 = 0; b0 = 1; b1 = 1; #10;
   a0 = 1; a1 = 1; b0 = 0; b1 = 0; #10;
   a0 = 1; a1 = 1; b0 = 0; b1 = 1; #10;
   a0 = 1; a1 = 1; b0 = 1; b1 = 0; #10;
   a0 = 1; a1 = 1; b0 = 1; b1 = 1; #10;
   $stop;
end
endmodule
```

2 bit comparator

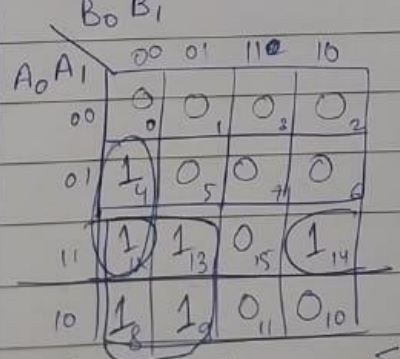


A_0 A_1	B_0 B_1	A>B	A=B	A<B
0 0	0 0	0	1	0
0 0	0 1	0	0	1
0 0	1 0	0	0	1
0 0	1 1	0	0	1
0 1	0 0	1	0	0
0 1	0 1	0	1	0
0 1	1 0	0	0	1
0 1	1 1	0	0	1
1 0	0 0	1	0	0
1 0	0 1	1	0	0
1 0	1 0	0	1	0
1 0	1 1	0	0	1
1 1	0 0	1	0	0
1 1	0 1	1	0	0
1 1	1 0	1	0	0
1 1	1 1	0	1	0

$(A_1 \odot B_1)(A_0 \odot B_0)$

$B_0 B_1 \bar{A}_1$

$\bar{A}_0 B_0 + \bar{A}_0 \bar{A}_1 B_1 +$ ~~$B_0 A_1 \bar{B}_0 \bar{B}_1$~~



$A_0\bar{B}_0 + A_1 B_0 \bar{B}_1 + A_0 A_1 \bar{B}_1$

$\bar{A}_0 \bar{A}_1 \bar{B}_0 \bar{B}_1 + \bar{A}_0 A_1 \bar{B}_0 B_1 +$
$A_0 A_1 B_0 B_1 + A_0 \bar{A}_1 B_0 \bar{B}_1$

Page No.