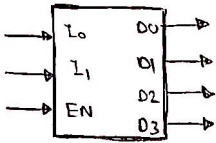
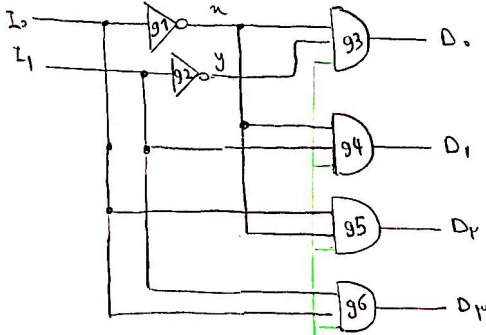


آزمایش 5 :  
: part 1



| $I_0$ | $I_1$ | EN | $D_0$ | $D_1$ | $D_2$ | $D_3$ |
|-------|-------|----|-------|-------|-------|-------|
| X     | X     | 0  | 0     | 0     | 0     | 0     |
| 0     | 0     | 1  | 1     | 0     | 0     | 0     |
| 0     | 1     | 1  | 0     | 1     | 0     | 0     |
| 1     | 0     | 1  | 0     | 0     | 1     | 0     |
| 1     | 1     | 1  | 0     | 0     | 0     | 1     |



$$D_0 = \overline{I_1} \cdot \overline{I_0}$$

$$D_1 = \overline{I_0} \cdot I_1$$

$$D_2 = I_0 \cdot \overline{I_1}$$

$$D_3 = I_0 \cdot I_1$$

```
module decoder2x4 ( EN
    input [1:0] in,
    input      en,
    output [3:0] dout,
    );
```

```
    wire n,y;
```

```
    not g1( n, in[0] );
```

```
    not g2( y, in[1] );
```

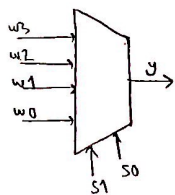
```
    and g3( dout[0], n,y,en );
```

```
    and g4( dout[1], n, in[1],en );
```

```
    and g5( dout[2], n, in[0],en );
```

```
    and g6( dout[3], in[0],in[1],en );
```

```
end module
```



| s0 | s1 | y  |
|----|----|----|
| 0  | 0  | w0 |
| 0  | 1  | w1 |
| 1  | 0  | w2 |
| 1  | 1  | w3 |

```

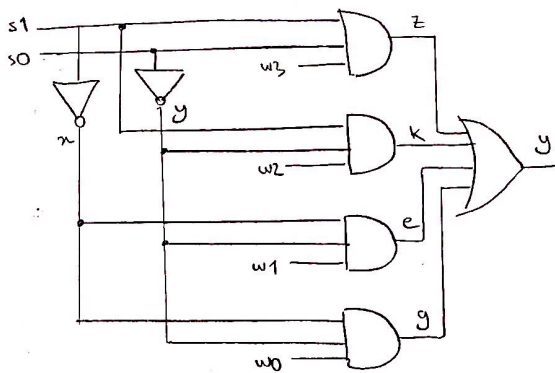
module multiplexer4x1(
    input [3:0] w,
    input [1:0] sel,
    output y,
);

```

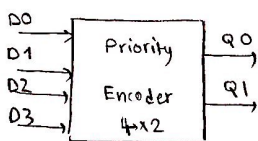
```

    wire n, y, z, k, e, g;
    not (n, sel[1]);
    not (y, sel[0]);
    and (z, sel[1], sel[0], w[3]);
    and (k, y, sel[1], w[2]);
    and (e, e, n, y, w[1]);
    and (g, g, n, y, w[0]);
    or (y, z, k, e, g);
endmodule

```



$$F = s_0' s_1' w_0 + s_0' s_1 w_1 + s_0 s_1' w_2 + s_0 s_1 w_3$$



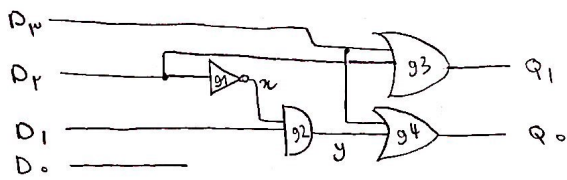
| D <sub>3</sub> | D <sub>2</sub> | D <sub>1</sub> | D <sub>0</sub> | Q <sub>1</sub> | Q <sub>0</sub> |
|----------------|----------------|----------------|----------------|----------------|----------------|
| 0              | 0              | 0              | 0              | x              | x              |
| 0              | 0              | 0              | 1              | 0              | 0              |
| 0              | 0              | 1              | x              | 0              | 1              |
| 0              | 1              | x              | x              | 1              | 0              |
| 1              | x              | x              | x              | 1              | 1              |

| D <sub>3</sub> D <sub>2</sub> | 00 | 01 | 11 | 10 |
|-------------------------------|----|----|----|----|
| 00                            | X  | 0  | 0  | 0  |
| 01                            | 1  | 1  | 1  | 1  |
| 11                            | 1  | 1  | 1  | 1  |
| 10                            | 1  | 1  | 1  | 1  |

$$Q_1 = D_2 + D_3$$

| D <sub>3</sub> D <sub>2</sub> | 00 | 01 | 11 | 10 |
|-------------------------------|----|----|----|----|
| 00                            | X  | 0  | 1  | 1  |
| 01                            | 0  | 0  | 0  | 0  |
| 11                            | 1  | 1  | 1  | 1  |
| 10                            | 1  | 1  | 1  | 1  |

$$Q_0 = D_3 + D_1 D_2'$$



```

module encoder4x2(
    input [3:0] din,
    output [1:0] qout,
);
    wire n, y;
    Or g3( qout[1], din[3], din[2]);
    not g1( n, din[2]);
    and g2( y, n, din[1]);
    or g4( qout[0], y, din[3]);
end module

```