



Lab Report

LAB — 07

CSE — 206

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CSE — 206

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Lab-07

Name of the experiment: To check the operation of active low demux, octal to binary encoder, Decimal to BCD encoder and Hexadecimal to binary encoder.

Demux:

Description: The demux (demultiplexer) is a combinational logic circuit designed to switch one common input line to one of several separate output line. The demux is also known as two to four demultiplexer. (two inputs, four outputs)

Truth Table:

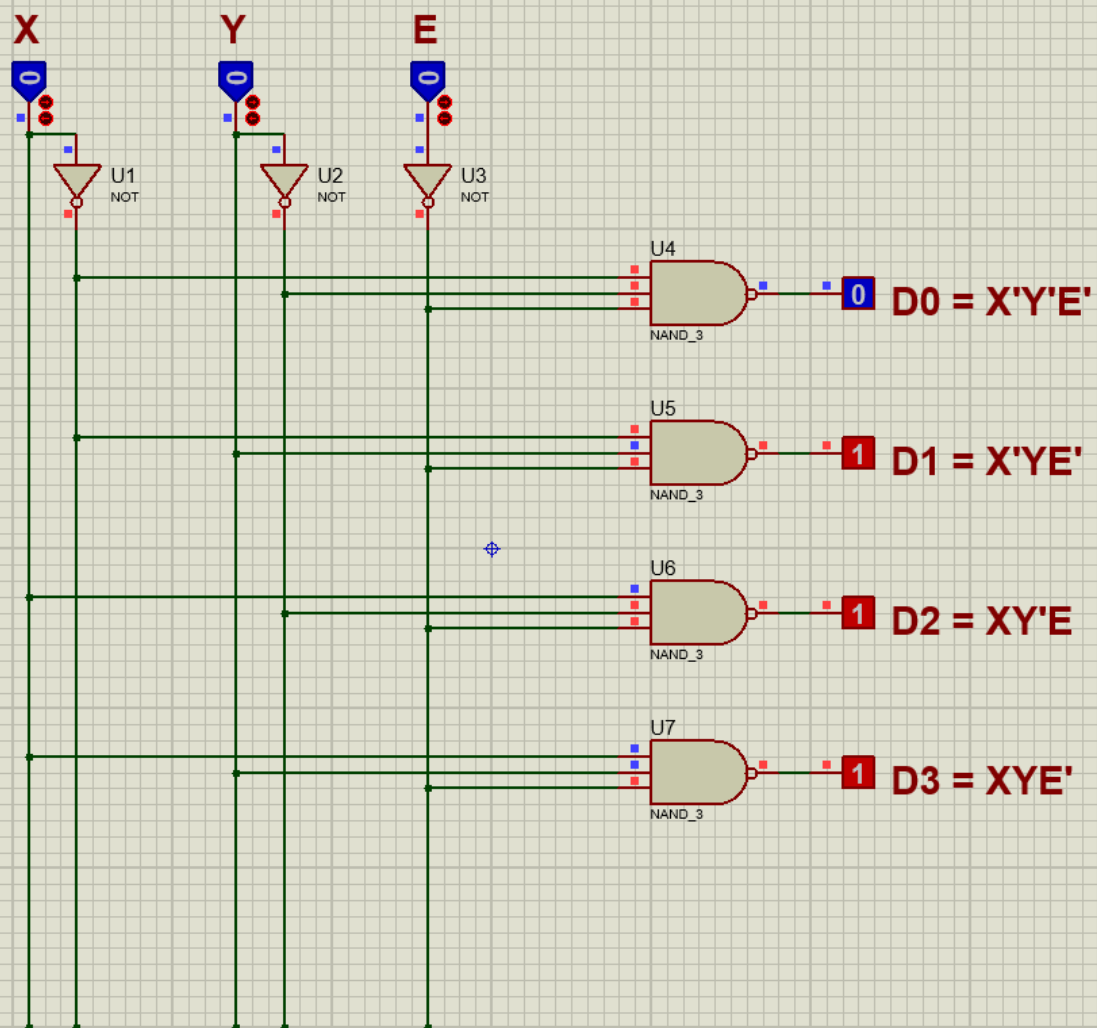
| E | X | Y | D ₀ | D ₁ | D ₂ | D ₃ |
|---|---|---|----------------|----------------|----------------|----------------|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 |

$$\begin{aligned}
 \therefore D_0 &= E + X + Y \\
 &= \overline{\overline{E + X + Y}} \\
 &= \overline{E' \cdot X' \cdot Y'}
 \end{aligned}$$

$$\begin{aligned}
 \therefore D_1 &= E + X + Y' \\
 &= \overline{\overline{E + X + Y'}} \\
 &= \overline{E' \cdot X' \cdot Y}
 \end{aligned}$$

$$\begin{aligned}
 \therefore D_2 &= E + X' + Y \\
 &= \overline{\overline{E + X' + Y}} \\
 &= \overline{E' \cdot X \cdot Y'}
 \end{aligned}$$

$$\begin{aligned}
 \therefore D_3 &= E + X' + Y' \\
 &= \overline{\overline{E + X' + Y'}} \\
 &= \overline{E' \cdot X \cdot Y}
 \end{aligned}$$



Octal to Binary encoder:

Octal to Binary encoder consists of eight inputs, one for each of eight digits and three outputs which generate the consequent binary numbers.

| D_0 | D_1 | D_2 | D_3 | D_4 | D_5 | D_6 | D_7 | X | Y | Z |
|-------|-------|-------|-------|-------|-------|-------|-------|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

$$X = D_4 + D_5 + D_6 + D_7$$

$$Y = D_2 + D_3 + D_6 + D_7$$

$$Z = D_1 + D_3 + D_5 + D_7$$

D0 D1 D2 D3 D4 D5 D6 D7



U1
OR_4

$$Z = D1 + D3 + D5 + D7$$

0

U2
OR_4

$$Y = D2 + D3 + D6 + D7$$

0

U3
OR_4

$$X = D4 + D5 + D6 + D7$$

0

Decimal to BCD encoder:

Decimal to BCD encoder consists of ten input and four output lines. Each input line corresponds to the each decimal digit and four output lines correspond to the BCD code.

| D ₀ | D ₁ | D ₂ | D ₃ | D ₄ | D ₅ | D ₆ | D ₇ | D ₈ | D ₉ | A ₃ | A ₂ | A ₁ | A ₀ |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |

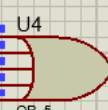
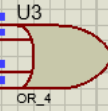
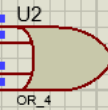
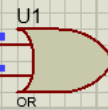
$$A_3 = D_8 + D_9$$

$$A_2 = D_4 + D_5 + D_6 + D_7$$

$$A_1 = D_2 + D_3 + D_6 + D_7$$

$$A_0 = D_1 + D_3 + D_5 + D_7 + D_9$$

D0 D1 D2 D3 D4 D5 D6 D7 D8 D9



Hexadecimal to Binary encoder:

Hexadecimal is used for larger calculation. But in a computer those hexadecimal numbers need to be converted in binary so that a computer can easily understand the commands. This type of encoder usually consists of 16 line input and 4 line output.

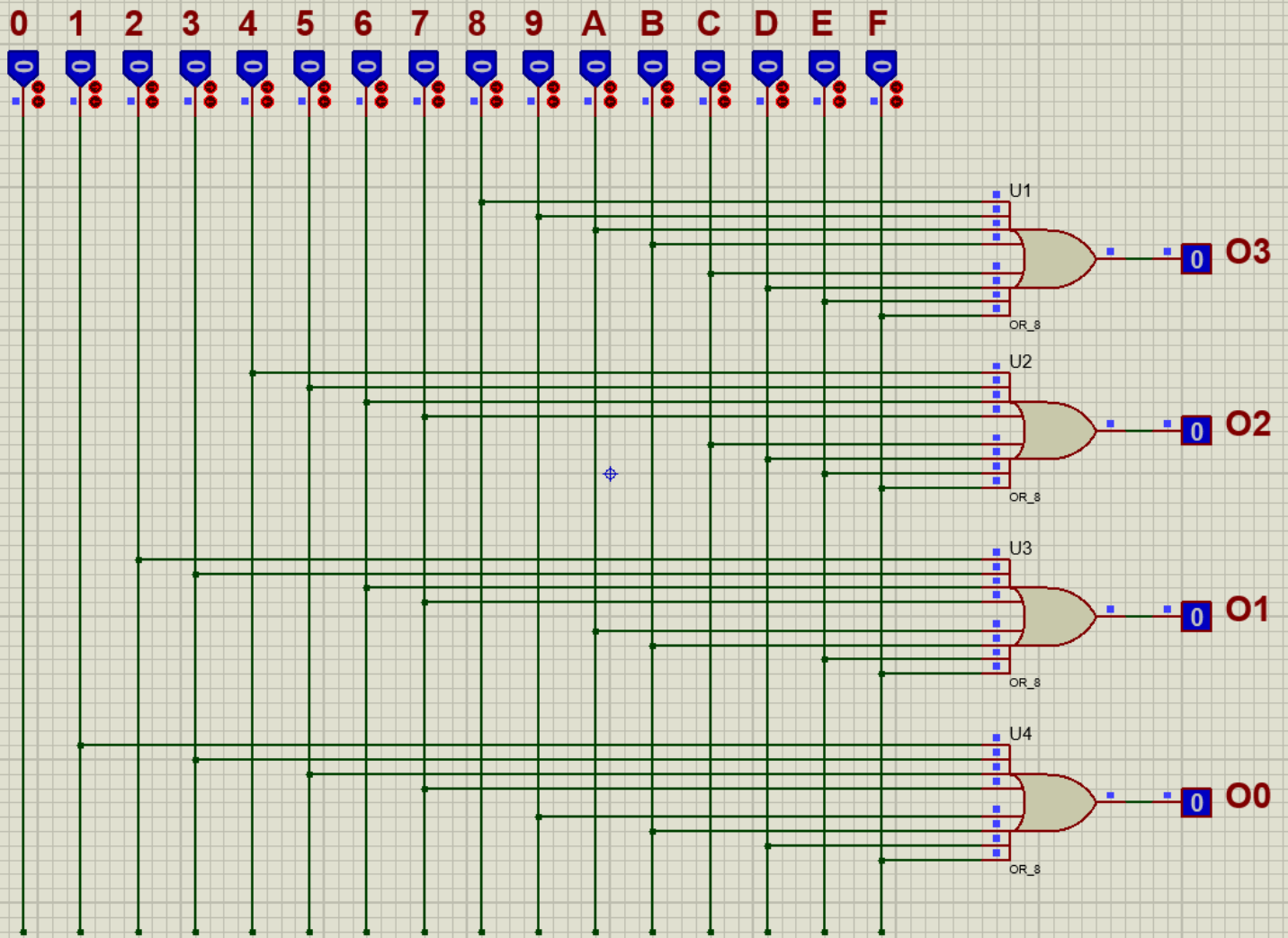
| Inputs | | | | | | | | | | | | | | | | Outputs | | | |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----------------|----------------|----------------|----------------|
| F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | O ₃ | O ₂ | O ₁ | O ₀ |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

$$O_3 = 8 + 9 + A + B + C + D + E + F$$

$$O_2 = 4 + 5 + 6 + 7 + C + D + E + F$$

$$O_1 = 2 + 3 + 6 + 7 + A + B + E + F$$

$$O_0 = 1 + 3 + 5 + 7 + 9 + B + D + F$$



Conclusion:

- (i) We have learnt how to design an Octal to Binary encoder.
- (ii) We have learnt how to design a Hexadecimal to Binary encoder.
- (iii) We have learnt how to design a Decimal to BCD encoder.
- (iv) We have learnt how to implement demultiplexer.
- (v) We have also learnt many encoding techniques with their circuit diagram.

THE END