

Digital Logic Design (EL-1005) LABORATORY MANUAL Spring-2024



LAB 09 Binary Decoder

STUDENT NAME

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SEC

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MARKS AWARDED: /10

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Lab Session 09: Binary Decoder

OBJECTIVES:

- Define basics of decoding mechanism
- Explain the working principle of 3-8-line decoder & BCD to Seven Segment decoder
- Understand the usage of Seven Segment Display
- Familiarize with some important terminologies like
 - Common Anode & Common Cathode Display
 - Active High enable & Active Low enable devices

APPARATUS: Logic trainer, Logic probe

COMPONENTS: 74LS138 (3-8-line decoder), 74LS47 (BCD to Seven Segment Decoder)

THEORY:

Decoder is a multiple-input, multiple-output logic circuit that converts coded inputs into coded output coded outputs. The basic function of decoder is to detect the presence of a specified combination of bits (code) at its input and indicate the presence of that code by a specified output. Various kinds of decoding include n-to-2ⁿ decoding & binary-coded decimal decoding. Decoder has Enable inputs which must be on for the decoder to function.

a. Implementation of 3-8-line Decoder using IC 74LS138

This decoder decodes one of eight lines depending on the three binary select inputs and three enable pins. It is an octal decoder capable of decoding eight possible three-bit combinations to eight separate active-Low outputs.

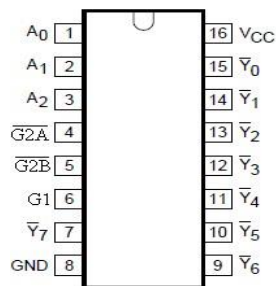


Fig 1. Pin Configuration

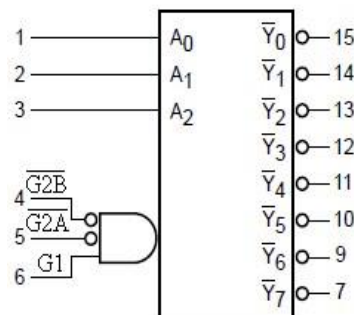


Fig 2. Logic Symbol

$A_0 - A_2$	Input Bits
G_{2A}', G_{2B}'	Enable (Active LOW) Inputs
G_1	Enable (Active HIGH) Inputs
$Y_0' - Y_7'$	Active LOW Outputs

b. Implementation of BCD to Seven Segment Decoder using IC 74LS47

The BCD to Seven Segment Decoder accepts BCD code on its input and provides outputs to drive Seven-segment display devices to produce a decimal read-out by turning on the appropriate LED segments.

If the Seven Segment display is a common-anode display that is an active Low (Low- enable) device because it takes 0 to turn on a segment, the decoder IC to be used must also have active Low outputs. IC 74LS47 has active low outputs therefore it will require a common-anode display device for compatibility.

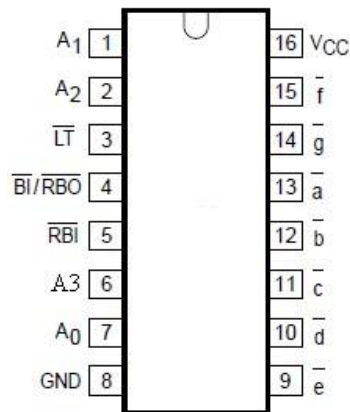


Fig 3. Pin Configuration

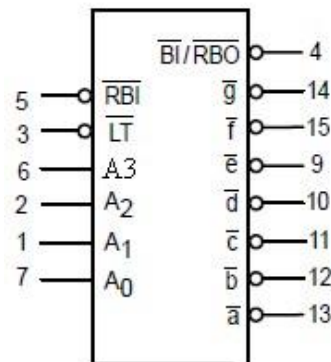
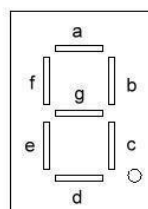
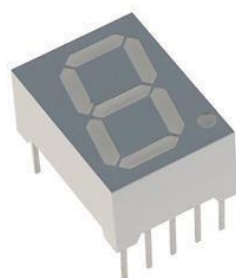


Fig 4. Logic Symbol

$A_0 - A_3$	BCD Inputs
\overline{RBI}'	Ripple Blanking Input (Active LOW)
\overline{LT}'	Lamp Test Input (Active LOW)
$\overline{BI}'/\overline{RBO}'$	Blanking Input or Ripple Blanking Output (Active LOW)
$a' - g'$	Active LOW Outputs

Seven -Segment Display



Common Anode Display Active low inputs

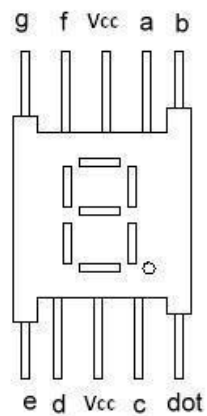


Fig 6. Pin Configuration

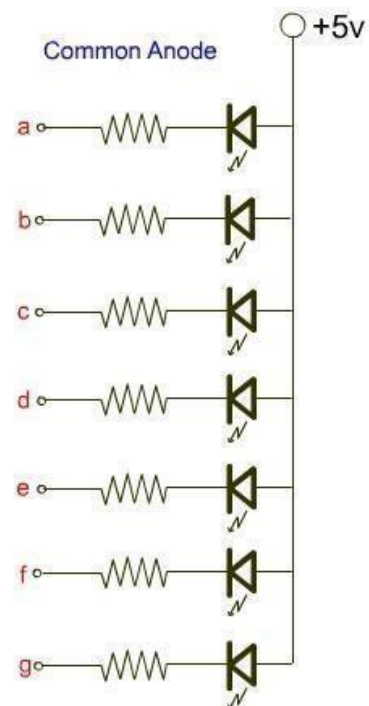


Fig 7. Internal circuit

LAB TASK

Exercise # 1

Implementation of 3-8-line Decoder using IC 74LS138

a. 3-8-line Decoder

[illegible]

Exercise # 2

You are required to display the outputs of a 74148 encoder IC on a seven segment display using Logic Works, also implement on breadboard. The circuit is given in figure.

