

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



Binary Encoder LAB 10

STUDENT NAME

ROLL NO

SEC

INSTRUCTOR SIGNATURE& DATE

MARKS AWARDED: /10

NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES (NUCES), KARACHI

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Lab Session 10: Binary Encoder

OBJECTIVES:

- Define basics of decoding mechanism
- Explain the working principle of 8-3-line decoder & Seven Segment to BCD 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

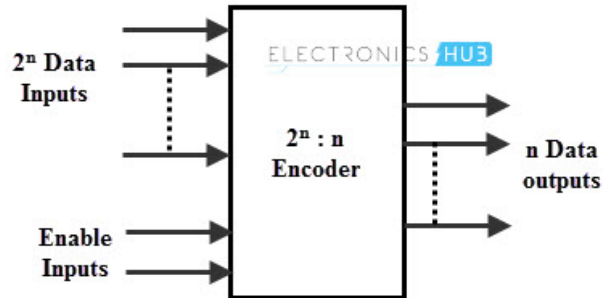
APPARATUS: Logic trainer, Logic probe

COMPONENTS: ICs 74LS148 , 74LS147

THEORY:

- An encoder is a device which converts familiar numbers or characters or symbols into a coded format. It accepts the alphabetic characters and decimal numbers as inputs and produces the outputs as a coded representation of the inputs.
- It encodes the given information into a more compact form. In other words, it is a combinational circuit that performs the opposite function of a decoder.
- These are mainly used to reduce the number of bits needed to represent given information. In digital systems, encoders are used for transmitting information. Thus, the transmission link uses fewer lines to transmit the encoded information.
- In addition, these encoders are used for encoding the data which is to be stored for later use as it facilitates fewer bits storing over the available space. Let us discuss various types of binary encoders.

A binary encoder has 2^n input lines and n output lines; hence it encodes the information from 2^n inputs into an n -bit code. Depending on the number of input lines, digital or binary encoders produce the output codes in the form of 2 or 3- or 4-bit codes.

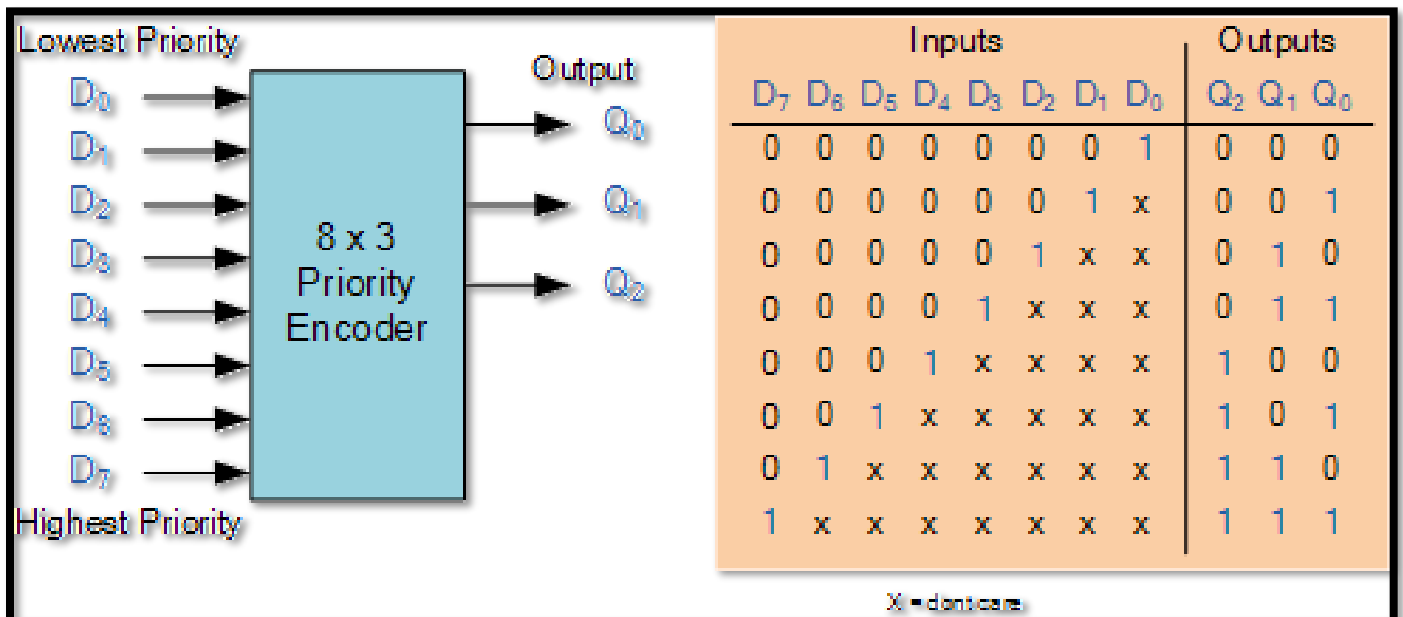


Priority Encoder

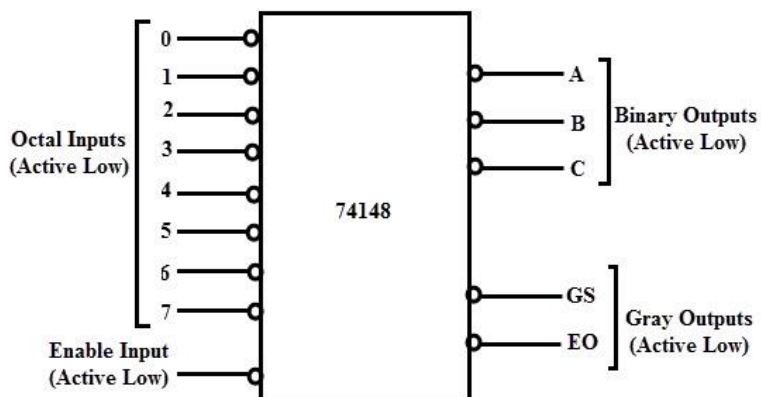
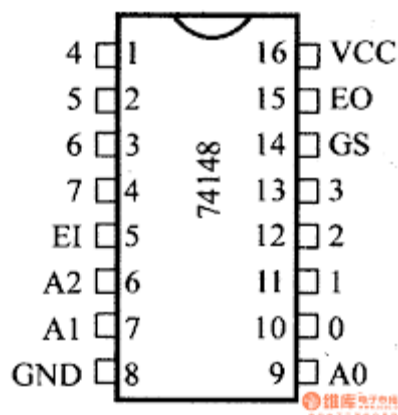
A priority encoder is a circuit or algorithm that compresses multiple binary inputs into a smaller number of outputs. The output of a priority encoder is the binary representation of the original number starting from zero of the most significant input bits. If two or more inputs are given at the same time, the input having the highest priority will take precedence.

Octal to Binary (8x3) Encoder (74148)

An octal to binary encoder consists of eight input lines and three output lines. Each input line corresponds to each octal digit and three outputs generate corresponding binary code.

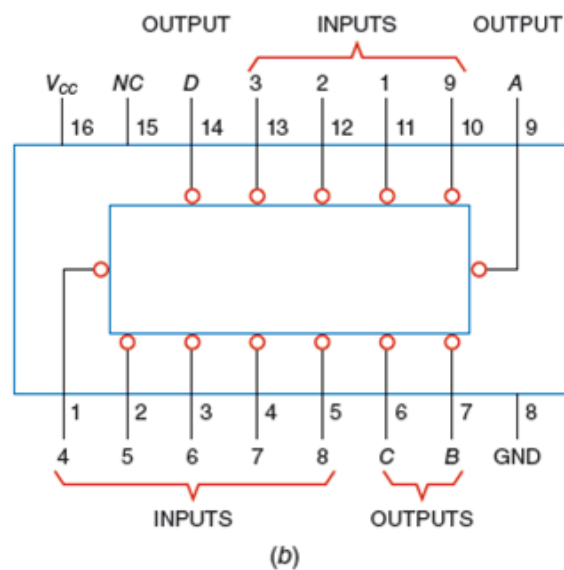
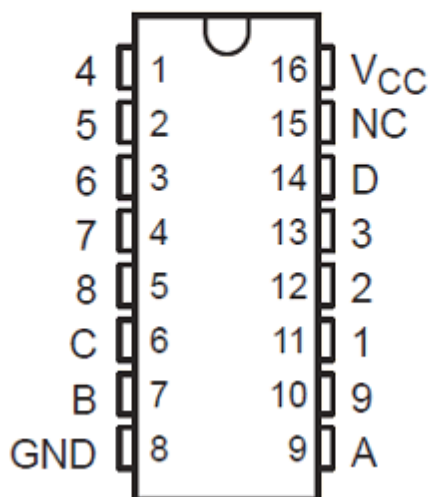


Pin Configuration



Decimal to BCD Priority Encoder (74147)

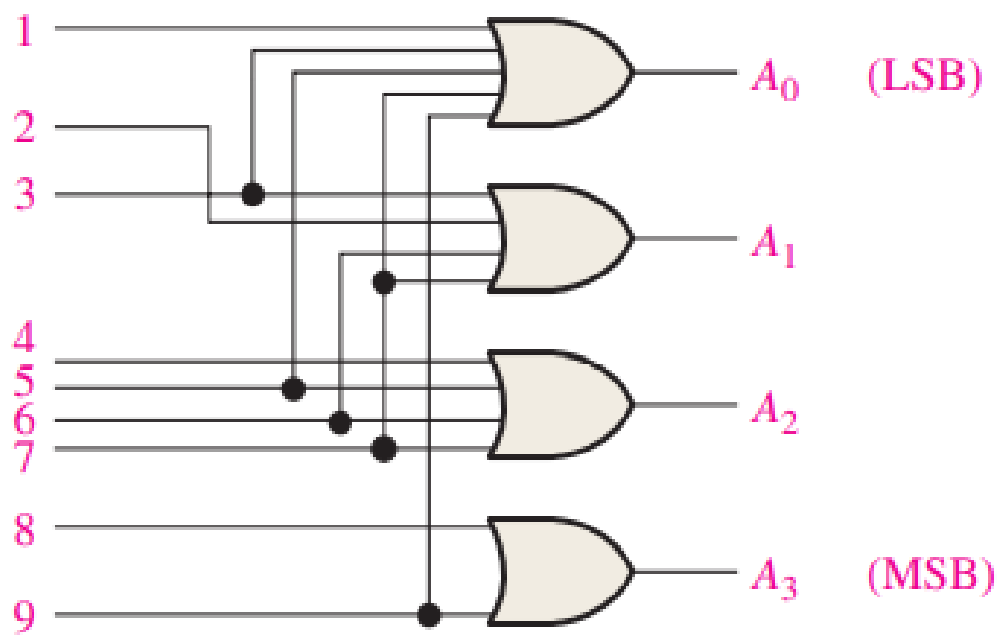
74147



$$A_3 = 8 + 9 \quad A_1 = 2 + 3 + 6 + 7$$

$$A_2 = 4 + 5 + 6 + 7 \quad A_0 = 1 + 3 + 5 + 7 + 9$$

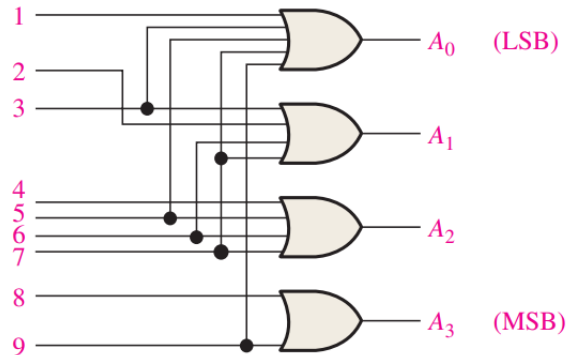
Decimal Digit	BCD Code			
	A_3	A_2	A_1	A_0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1



Lab Tasks

Lab Task#1: Suppose the HIGH levels are applied to the 2 input and the 9 input of the circuit in figure.

- What are the states of the output lines?
- Does this represent a valid BCD code?
- What is the restriction on the encoder logic in the Figure?



Lab Task#2:

- Design and Implement Octal to Binary Priority Encoder on Breadboard using 74148 IC.
- Draw the Truth Table for the Octal to Binary Priority Encoder.

Lab Task#3:

- Design and Implement Decimal to BCD Priority Encoder on Bread Board using 74147 IC.
- Draw the Truth Table for the Decimal to BCD Priority Encoder.

Lab Task#4: You are required to display the outputs of a 74148 encoder IC on a seven-segment display using Logic Works, also implement on breadboard.

