Encoders

An **Encoder** is a combinational circuit that performs the reverse operation of Decoder. It has maximum of 2^n input lines and 'n' output lines. It will produce a binary code equivalent to the input, which is active High. Therefore, the encoder encodes 2^n input lines with 'n' bits. It is optional to represent the enable signal in encoders.

4 to 2 Encoder

Let 4 to 2 Encoder has four inputs Y_3, Y_2, Y_1 & Y_0 and two outputs A_1 & A_0. The **block diagram** of 4 to 2 Encoder is shown in the following figure.

At any time, only one of these 4 inputs can be '1' in order to get the respective binary code at the output. The **Truth table** of 4 to 2 encoder is shown below.
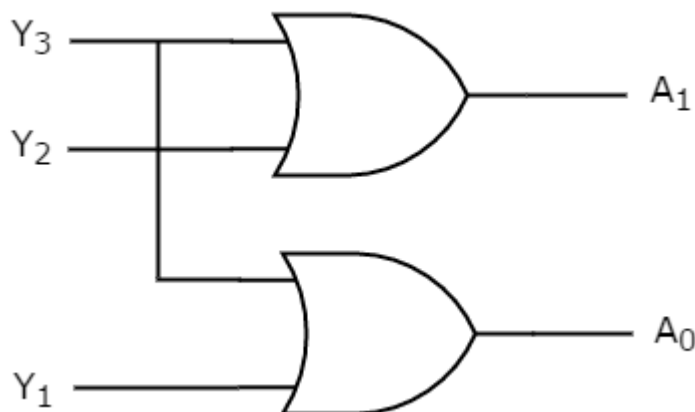
Inputs				Outputs	
Y_3	Y_2	Y_1	Y_0	A_1	A_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

From Truth table, we can write the **Boolean functions** for each output as

$$A_1 = Y_3 + Y_2$$

$$A_0 = Y_3 + Y_1$$

We can implement the above two Boolean functions by using two input OR gates. The **circuit diagram** of 4 to 2 encoder is shown in the following figure.

The above circuit diagram contains two OR gates. These OR gates encode the four inputs with two bits

Decoder:

The decoder is an electronic device that is used to convert a digital signal to an analog signal. It allows a single input line and produces multiple output lines. The decoders are used in many communication projects that are used to communicate between two devices. The decoder allows N- inputs and generates 2 power N-numbers of outputs. For example, if we give 2 inputs that will produce 4 outputs by using 4 by 2 decoders.
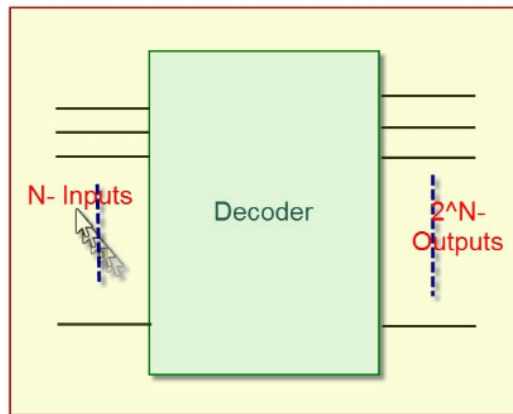
A_1	A_0	D_3	D_2	D_1	D_0
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0