EE5811
Assignment 1

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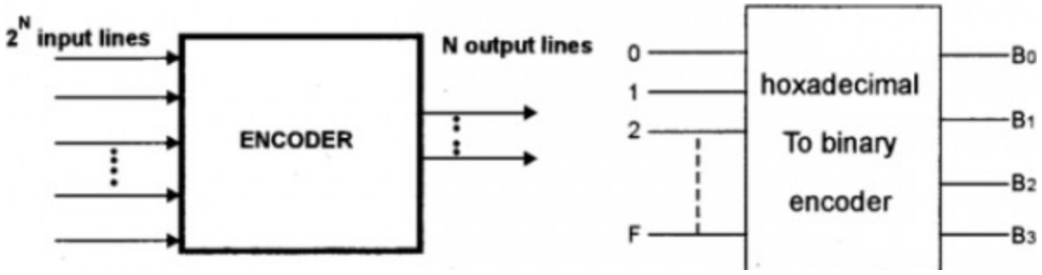
1 Problem

What is an Encoder? Draw the encoder circuit to convert A-F hexadecimal numbers to binary. State an application of a Multiplexer.

2 Encoder

An encoder is a combinational circuit that encodes an input of length 2^N to N outputs.



Encoder block diagram
Hexadecimal to Binary

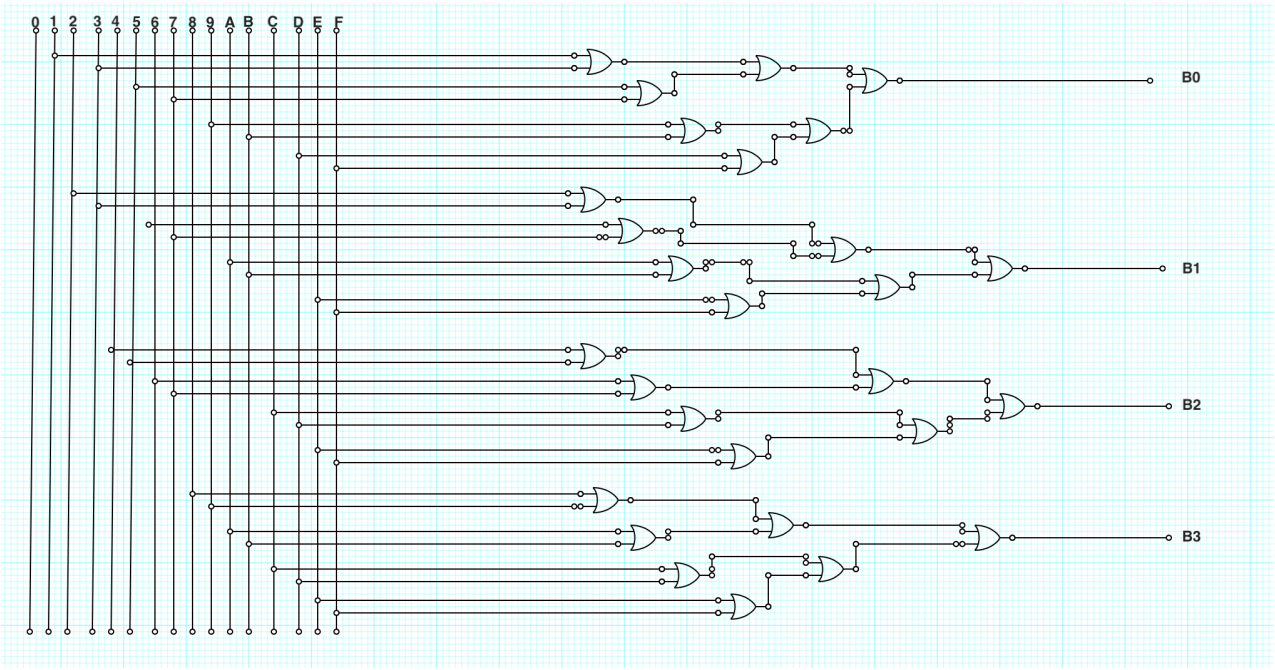
The hexadecimal systems consists of 16 digits: 0,1,2,..9,A,B,C,D,E,F representing the numbers from 1 to 16.
$16 = 2^4 \implies$ we need at least 4 bits to represent the 16 hexadecimal digits.

2.1 Circuit to convert hexadecimal to binary

Digit	B_3	B_2	B_1	B_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
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Truth Table

The logic is:
$B_0 = 1 + 3 + 5 + 7 + 9 + B + D + F$
$B_1 = 2 + 3 + 6 + 7 + A + B + E + F$
$B_2 = 4 + 5 + 6 + 7 + C + D + E + F$
$B_3 = 8 + 9 + A + B + C + D + E + F$

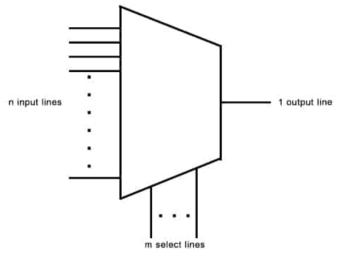


Encoder for hexadecimal digit to binary conversion

3 Application of Multiplexer

3.1 What is a Multiplexer?

A multiplexer is a combinational circuit which selects on of the input data and outputs it.



Multiplexer

3.2 Application

Multiplexers are used in communications to transmit data from different channels.
Another application is in computer peripherals, for example in a multiplex keyboard a multiplexer takes different data from it and send it through a single port.