CPE/EEE 64 PAL Worksheet

DECODERS AND ENCODERS WORKSHEET

1) A decoder is a combinational circuit that converts binary information from n input lines to a maximum of 2^n unique output lines. If the n -bit coded information has unused combinations, then what happens to the decoder output?

Example1) Using a decoder and external gates, design the combinational circuit defined by the following Boolean functions,
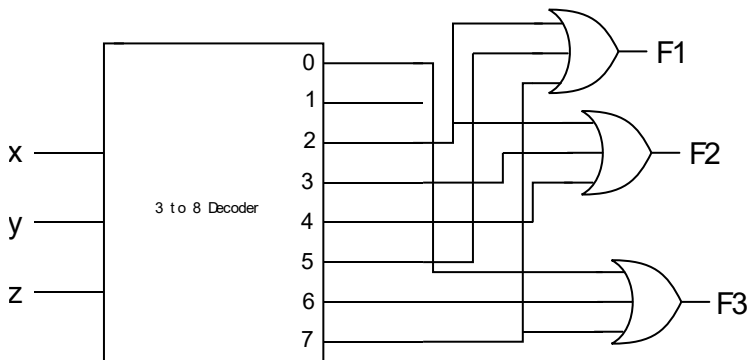
$F_1 = x'yz' + xz$
$F_2 = xy'z' + x'y$
$F_3 = x'y'z' + xy$

$F_1 = x'yz' + xz(y + y') = x'yz' + xyz + xy'z = \sum(2,5,7)$

$F_2 = xy'z' + x'y(z + z') = xy'z' + x'yz + x'yz' = \sum(2,3,4)$

$F_3 = x'y'z' + xy(z + z') = x'y'z' + xyz + xyz' = \sum(0,6,7)$

2)

Using a decoder and external gates, design the combinational circuit defined by the following Boolean functions,

$F_1 = (y' + z)x$
$F_2 = y'z' + x'y + yz'$
$F_3 = (x + y)z$

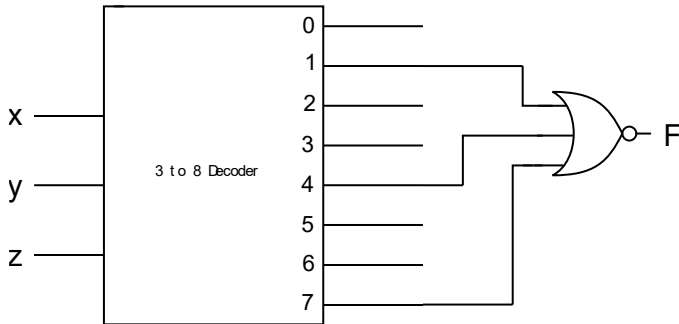Example 2) How many 2x4 decoders will be required to implement 4x16 decoder?
16/4 = 4
4/4 = 1

⇨ 4+1 =5

3) How many 3x8 decoders will be required to implement 6x64 decoder?
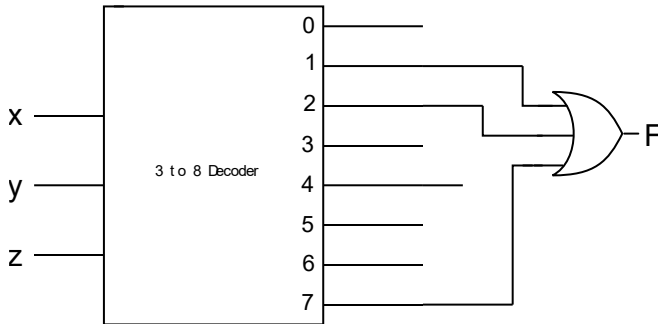4) How many 4x16 decoders will be required to implement 8x256 decoder?

Example 3) Find $F(x, y, z)$ = ?

Since a NOR gate connected to output $F(x, y, z) = \Sigma(0,2,3,5,6)$

5) Find $F(x, y, z)$ = ?

An encoder has 2n (or fewer) input lines and n output lines. The output lines, as an aggregate, generate the binary code corresponding to the input value.

6) A decimal to binary encoder will have how many inputs and outputs?
7) The output 2-bit comparator is logic 1 when the input X is greater than the input Y. How do you calculate the total number of combinations for which the output is logic 1?
8) Explain if and how a BCD to seven segment conversion requires an encoder or decoder.
9) Can an encoder can be built by using which basic logic gate? Explain how.
10) Can a decoder be built by using which universal gate? Shown an example.