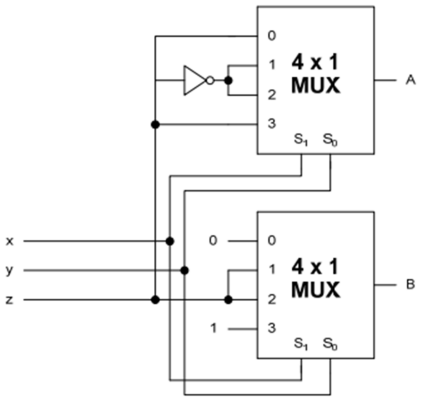
Logic Design – Homework 7

(1) Design a 4-to-16 decoder using 2-to-4 decoders with enable input.

(2) Using four 3x8 decoders with enable input and one 2x4 decoder, design a 5x32 decoder.

(3) Express the A and B outputs of the following circuit as sum-of-minterms.



(4) Design two of the following functions with **(a)** a multiplexer and **(b)** a decoder.

Students should answer one of the options **between (I) and (X)** based on the **last digit** of their **student number**.
Students should also answer one of the options **between (XI) and (XV)** by calculating **(XI + mod 5 of the last digit** of their **student number)**. For example students with 8 as the last digit of their student number should answer (XI + 3 = XIV).

(I) $F(A,B,C) = \sum m(0,1,2,6,7)$
(II) $F(A,B,C) = \sum m(2,3,4,5,6)$
(III) $F(A,B,C) = \sum m(2,5,6,7)$
(IV) $F(A,B,C,D) = \sum m(0,1,4,7,9,12)$
(V) $F(A,B,C,D) = \sum m(2,4,6,9,10,15)$
(VI) $F(W,X,Y,Z) = \sum m(2,3,6,7,9,11,13,15)$
(VII) $F(W,X,Y,Z) = \sum m(0,1,3,4,8,9,14)$
(VIII) $F(W,X,Y,Z) = \sum m(0,2,3,6,11,13,14)$
(IX) $F(W,X,Y,Z) = \sum m(1,2,4,6,7,11,15)$
(X) $F(W,X,Y,Z) = \sum m(3,4,5,10,11,12,14)$

(XI) $F(X,Y,Z) = XY' + YZ$
(XII) $F(X,Y,Z) = XY' + X'Y'Z$
(XIII) $F(X,Y,Z) = Y'Z' + XY' + YZ'$
(XIV) $F(X,Y,Z) = XY + X'Z + Y'Z'$
(XV) $F(X,Y,Z) = XY'Z' + XY + X'YZ$

(5) A combinational circuit is defined by the following Boolean functions. Design the circuit with a decoder and external gates.
F1 = x'y'z' + xz
F2 = xy'z' + x'y

(6) Using a multiplexer, design a combinatorial circuit that outputs 1 if the 4-bit input is a prime number.

(7) Using a decoder, design a combinatorial circuit that outputs the excess-3 code of the 3-bit input.

(8) Using a multiplexer, design a combinatorial circuit that calculates the even parity of a 4-bit number.

(9) Design a 16x1 multiplexer using two 8x1 multiplexer and one 2x1 multiplexer.