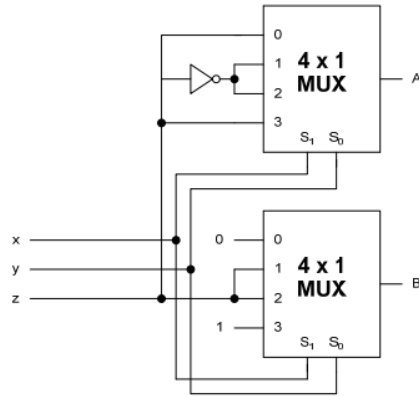# Logic Design – Homework 7

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

(2) Design the following functions with **(a)** a multiplexer and **(b)** a decoder.

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

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

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

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

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

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