MAD 3105 PRACTICE FOR FINAL EXAM
SOLUTIONS

These are solutions for a selected few of the practice problems. The rest may be found in the Course Notes, previous Test Reviews, or have been assigned as problems.

1. Boolean Algebra

(35) How many Boolean functions of degree n are there?

$$2^{2^n}$$

(36) Define the Boolean function, F, in the three variables, x, y, and z, by $F(1,1,0) = F(1,0,1) = F(0,0,0) = 1$ and $F(x,y,z) = 0$ for all other (x,y,z) in $\{0,1\}^3$.

(a) Find the sum-of-products form for F.

$$F(x,y,z) = xy\overline{z} + x\overline{y}z + \overline{x}\,\overline{y}\,\overline{z}$$

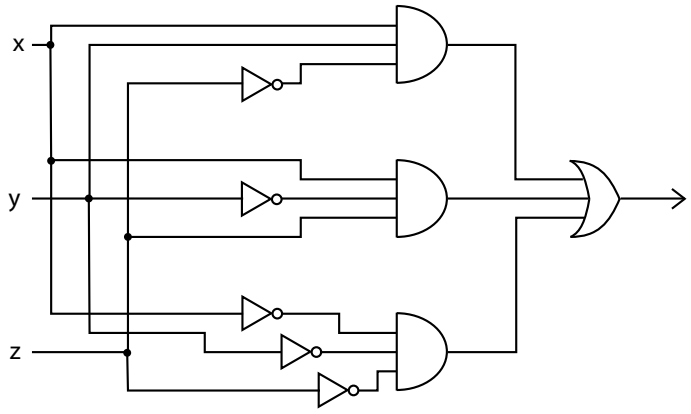
(b) Find the product-of-sums form for F.

$$F(x,y,z) = (\overline{x}+\overline{y}+\overline{z})(x+\overline{y}+\overline{z})(\overline{x}+y+z)(x+\overline{y}+z)(x+y+\overline{z})$$

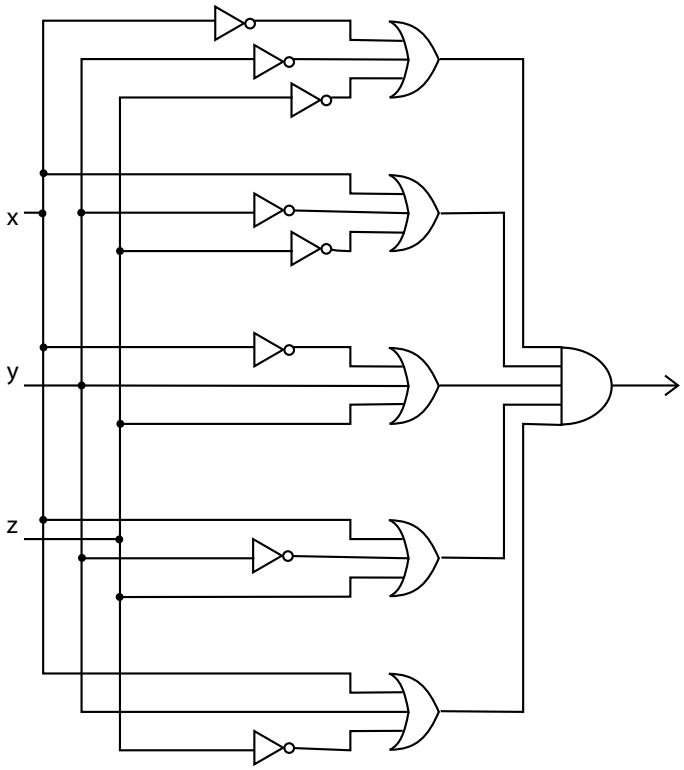
(c) Find the dual of the expression in part (a).

$$F^d(x,y,z) = (x+y+\overline{z})(x+\overline{y}+z)(\overline{x}+\overline{y}+\overline{z})$$

(d) Sketch the logical network that has the same output as F, and uses the order of operations given in the expression in part (a).

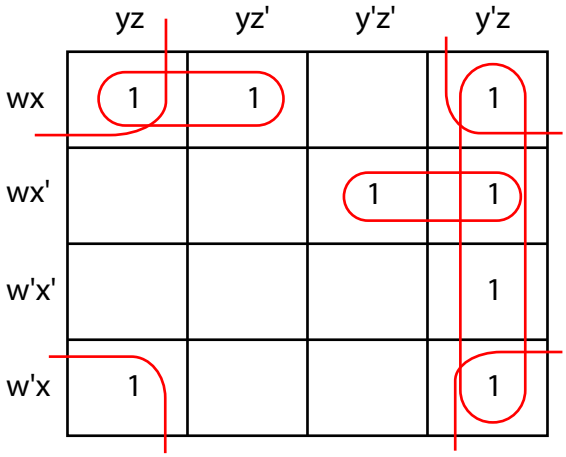


(e) Sketch the logical network that has the same output as F, and uses the order of operations given in the expression in part (b).



(48) Use (a) Karnaugh maps and (b) the Quine McClusky method to find a minimal expansion for $wxyz + wxy\overline{z} + wx\overline{y}z + w\overline{x}\,\overline{y}z + w\overline{x}\,\overline{y}\,\overline{z} + \overline{w}x\overline{y}z + \overline{w}xyz + \overline{w}\,\overline{x}\,\overline{y}z$

(a)



$$xz + y'z + wxy + wx'y'$$

(b)

1	$wxyz$	1111	4
2	$wxyz'$	1110	3
3	$wxy'z$	1101	3
4	$wx'y'z$	1001	2
5	$wx'y'z'$	1000	1
6	$w'xy'z$	0101	2
7	$w'xyz$	0111	3
8	$w'x'y'z$	0001	1

$(1,2)$	wxy	$111-$
$(1,3)$	wxz	$11-1$
$(1,7)$	xyz	-111
$(3,4)$	$wy'z$	$0-01$
$(3,6)$	$xy'z$	-101
$(4,5)$	$wx'y'$	$100-$
$(4,8)$	$x'y'z$	-001
$(6,7)$	$w'xz$	$01-1$
$(6,8)$	$w'y'z$	$0-01$

$(1,3,6,7)$	xz	$-1-1$
$(3,4,6,8)$	$y'z$	$--01$

$$xz + y'z + wxy + wx'y'$$