CSE 3100

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HW 1

1.7 Convert the hexadecimal number 64CD to binary and octal:

$64CD \xrightarrow{binary}$ $\boxed{0110\ 0100\ 1100\ 1101}$

octal $\Rightarrow$ 0 110 010 011 001 101 → 0 6 2 3 1 5 = $\boxed{(62315)_8}$

1.13 a.) Convert decimal 27.315 to binary:

$27.315 \xrightarrow{binary}$ $\boxed{11011.0101}$

obtain the 1's & 2's complements of the following:

1.14 a.) 10010000

1's compliment: + 1111 1111 => $\boxed{0110\ 1111}$

2's compliment: 01101111 + 0000 0001 => $\boxed{01110000}$

e.) 10100101

1's compliment: + 1111 1111 => $\boxed{01011010}$

2's compliment: 01011010 + 00000001 = $\boxed{01011011}$

1.18 Perform subtraction on the following using the 2's complement of the subtrahend. where the result should be negative, find its 2's complement and affix a minus sign.

a.) 10011 − 10010 = 10011 + 01110 = $\boxed{00001}$

2's complement with affix minus: + 0001 = $\boxed{00010}$

b.) 100010 − 100110 = $\boxed{100000}$

34   38   +0001 => $\boxed{100101}$

1.25 Represent the decimal number 6,428 in:

a.) BCD: $\boxed{0110\ 0010\ 0100\ 1000}$

b.) excess-3: $\boxed{1001\ 0101\ 0111\ 1011}$

c.) 2421 code: $\boxed{1100\ 0010\ 0100\ 1110}$

d.) 6311 code: $\boxed{1000\ 0011\ 0101\ 1011}$

2.2 simplify the following Boolean expressions to a minimum number of literals.

c.) $xyz + x'y + xyz' = xy(z+z') + x'y$

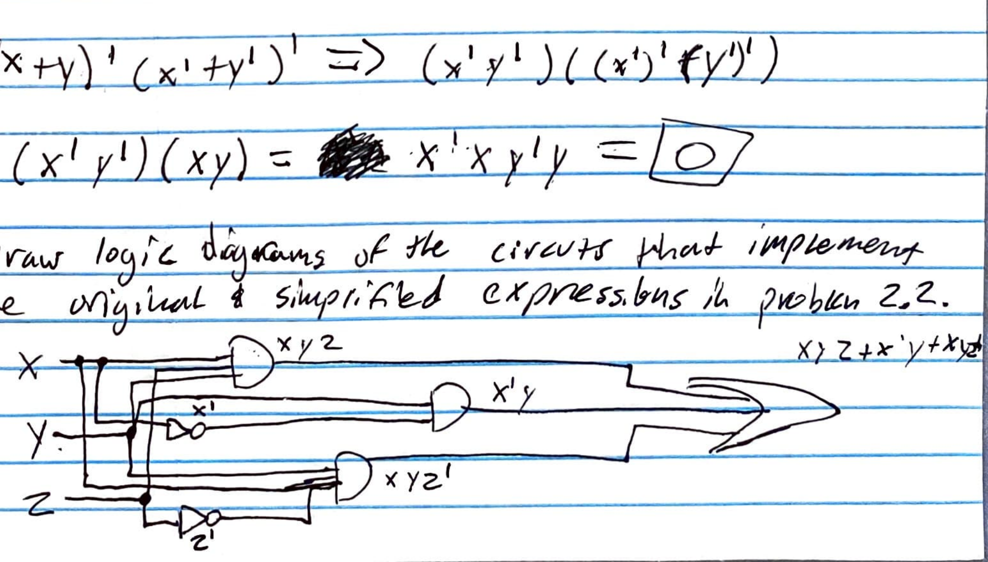
$\Rightarrow xy + x'y = y(x+x') = \boxed{y}$

d.) $(x+y)'(x'+y')' \Rightarrow (x'y')((x')'(y')')$

$= (x'y')(xy) = x'xy'y = \boxed{0}$

2.5 Draw logic diagrams of the circuits that implement the original & simplified expressions in problem 2.2.

c.)



2.4 Find the complement of the following expressions:

a.) $xy' + x'y$

Complement:

$\Rightarrow (xy'+x'y)' = (xy')'(x'y)' = (x'+y)(x+y')$

$= \cancel{x'x} + x'y' + yx + \cancel{y'y}$

$= \boxed{x'y' + xy}$

b.) $(a+c)(a+b')(a'+b+c')$

Complement: $((a+c)(a+b')(a'+b+c'))' = \boxed{(a'c') + (a'b) + (ab'c)}$

c.) $z + z'(v'w + xy)$

Complement: $(z+z'(v'w+xy))' =$

$= (\cancel{zz'})' + (v'w+xy)' = (vw')(x'y') = \boxed{vx' + vy' + w'x' + w'y'}$

2.17 Obtain the truth table of the following functions, & express each function in sum-of-minterms & product-of-max:

c.) $(c'+d)(b+c')$

Truth table:

a	b	c	d	c'+d	b+c'	F
0	0	0	0	1	1	1
0	0	0	1	1	1	1
0	0	1	0	0	0	0
0	0	1	1	1	0	0
0	1	0	0	1	1	1
0	1	0	1	1	1	1
0	1	1	0	0	1	0
0	1	1	1	1	1	1
1	0	0	0	1	1	1
1	0	0	1	1	1	1
1	0	1	0	0	0	0
1	0	1	1	1	0	0
1	1	0	0	1	1	1
1	1	0	1	1	1	1
1	1	1	0	0	1	0
1	1	1	1	1	1	1

Sum of minterm: $F = a'b'c'd' + a'b'c'd + a'bc'd' + a'bc'd + a'bcd + ab'c'd' + ab'c'd + abc'd' + abc'd + abcd$

Sum of max-terms: $F = (a+b+c'+d)(a+b+c'+d') \cdot (a+b'+c+d')(a'+b+c'+d)(a'+b+c'+d')(a'+b'+d'+c)$

d.) $bd' + acd' + ab'c + a'c'$

Truth table:

a	b	c	d	bd'	acd'	ab'c	a'c'	F
0	0	0	0	0	0	0	1	1
0	0	0	1	0	0	0	1	1
0	0	1	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0
0	1	0	0	1	0	0	1	1
0	1	0	1	0	0	0	1	1
0	1	1	0	1	0	0	0	1
0	1	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0
1	0	1	0	0	1	1	0	1
1	0	1	1	0	0	1	0	1
1	1	0	0	1	0	0	0	1
1	1	0	1	0	0	0	0	0
1	1	1	0	1	1	0	0	1
1	1	1	1	0	0	0	0	0

Sum of minterm: $F = a'b'c'd' + a'b'c'd + a'bc'd' + a'bc'd + a'bcd' + ab'cd' + ab'cd + abc'd' + abcd'$

Sum of maxterms: $F = (a+b+c'+d)(a+b+c'+d') \cdot (a+b'+c'+d')(a'+b+c+d)(a'+b+c+d')(a'+b'+c+d')(a'+b'+c'+d')$

2.22 ✓

2.28 Convert each of the following expressions into sum of products (SOP) & product of sums (POS):

a.) $(u+xw)(x+u'v)$

SOP: $\Rightarrow ux + uu'v + xxw + u'vwx = ux + wx + u'vwx$

$= ux + wx(1 + u'v) = \boxed{ux + wx}$

POS: $ux + wx = \boxed{(u+w)x}$

b.) $x' + x(x+y')(y+z')$

Sop: $\Rightarrow (x'+x)(x'+(x+y'))(x'+(y+z'))$

$= (x'+x+y')(x'+y+z') = (x'+x)+y'(x'+y+z')$

$= (1+y')(x'+y+z') = (x'+y+z')$

$= \boxed{x'+y+z'}$

~~SOP~~ POS: $\boxed{(x'+y+z')}$