Date

Assignment 1

1. (a) $234.5 = 2\times3^4+2\times3^3+2\times3^2+0\times3^1+0\times3^0+1\times3^{-1}+1\times3^{-2}+\cdots$

$= (22200)_3 + 1\times\sum_{i=1}^{\infty}3^{-i}$

$\boxed{=(22200.\dot{1})_3}$

(b) $234.5 = 1\times12^2+7\times12^1+6\times12^0+6\times12^{-1}=\boxed{(176.6)_{12}}$

(c) $(435)_6 = 4\times6^2+3\times6^1+5\times6^0=\boxed{167}$

(d) $(10110.0101)_2 = (010110.010100)_2 = \boxed{(26.24)_8}$

2. (a) Observed there is no carry bit and the max number of result "6666" is 6, so possible radices can be $\boxed{r \text{ that } r>6.}$

(b) Suppose the equation holds in $r$ radices.

$(302)_r = (20)_r \times (12.1)_r$, that is, $3r^2+2 = 2r\cdot(r+2+\frac{1}{r})$

Solved $r=0$ or $4$, hence the equation holds in $\boxed{4 \text{ radices.}}$

3. (a) $(a'+c)(a'+c')(a+b+c'd) = (a'+cc')(a+b+c'd)$

$= a'(a+b+c'd)$

$= a'a + a'(b+c'd)$

$\boxed{= a'(b+c'd)}$

(b) $abc'd+a'bd+abcd = abc'd+abcd+a'bd$

$= abd(c'+c)+a'bd$

$= abd+a'bd$

$= (a+a')bd$

$\boxed{= bd}$

4. (a) $(a+c)(a'+b+c)(a'+b'+c) = (a+c)(a'+bb'+c)$

$$= (a+c)(a'+c)$$

$$= (a+a')c$$

$$\boxed{= c}$$ Only 1 literal.

(b) $F = a'b'c' + a'b'c + a'bc' + a'bc + ab'c$

$$= a'(b'c' + b'c + bc' + bc) + a'b'c + ab'c$$

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

$$\boxed{= a' + b'c}$$ Has 3 literals.

5. (a) $F = (a+a')b(c+c')d + a(b+b')cd' + ab'c(d+d') + a'(b+b')c'(d+d')$

$$= a'b'c'd' + a'b'c'd + a'bc'd' + a'bc'd + a'bcd' + ab'cd' + ab'cd + abc'd' + abcd'$$

$$\boxed{\begin{array}{l} = \Sigma(0,1,4,5,6,10,11,12,14) \ \text{(som)} \\ \text{And then } F = \Pi(2,3,7,8,9,13,15) \ \text{(pom)} \end{array}}$$

(b) $F = (x' + yy' + z)(x' + y + zz')$

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

$$\boxed{\begin{array}{l} = \Pi(4,5,6) \ \text{(pom)} \\ \text{And then } F = \Sigma(0,1,2,3,7) \ \text{(som)} \end{array}}$$

6. (a) $F_1 = A'BC' + A'BC + ABC$

$$= A'BC' + A'BC + A'BC + ABC$$

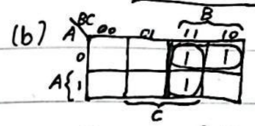
$$= A'B(C'+C) + (A'+A)BC$$

$$= A'B + BC$$

$$\boxed{= B(A'+C)}$$

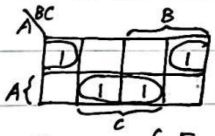
$$F_2 = A'B'C' + A'BC' + AB'C + ABC$$
$$= A'C'(B'+B) + AC(B'+B)$$
$$= A'C' + AC$$
$$\boxed{= (A \oplus C)'}$$

(b)



K-map of $F_1$

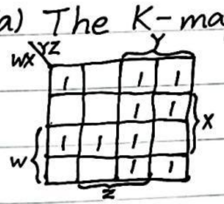
$\boxed{F_1 = A'B + BC}$



K-map of $F_2$

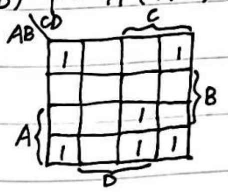
$\boxed{F_2 = A'C' + AC}$

7. (a) The K-map of F is below



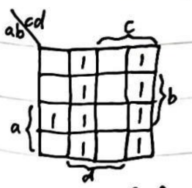
$\boxed{F = W'X'Z' + W'Y + X'Y + WXY' + YZ}$

(b) $F = \prod(1,3,4,5,6,7,9,12,13,14) = \sum(0,2,8,10,11,15)$

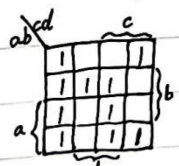


$\boxed{F = B'D' + ACD}$

8. The K-map of f and g are below, so we can get the K-map of fg.

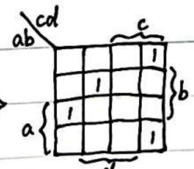


K-map of f



K-map of g

$\Rightarrow$



K-map of fg

Hence,
$$\boxed{\begin{aligned} fg &= b'cd' + a'bc'd + abc'd' \\ &= b'cd' + bc'(a \oplus d) \end{aligned}}$$

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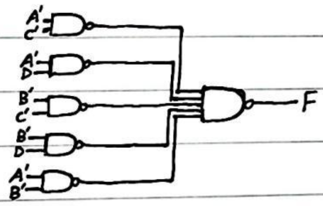
9. The K-map of f is below.

| AB \ CD | | | | |
|---|---|---|---|---|
| | X | 1 | X | 1 |
| | 1 | X | 1 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 1 | 1 | 0 |

$$F = A'C' + A'D + B'C' + B'D + A'B'$$

(a) $F = [(A'C')'(A'D)'(B'C')'(B'D)'(A'B')']'$




(b) $F' = [(A+C)' + (A+D')' + (B+C)' + (B+D')' + (A+B)']'$