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

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

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

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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, $3r^2 + 2 = 2r\cdot(r + 2 + \tfrac{1}{r})$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\qquad + abcd'$

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

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

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

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

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

$\qquad = A'BC' + A'BC + A'BC + ABC$

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

$\qquad = A'B + BC$

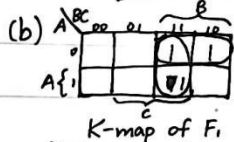$\qquad = \boxed{B(A'+C)}$

$$F_2 = A'B'C' + A'BC' + AB'C + ABC$$

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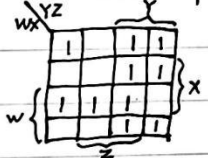
$$= A'C' + AC$$

$$\boxed{= (A \oplus C)'}$$

(b)

K-map of F_1

$$\boxed{F_1 = \Sigma(2,3,7)} \qquad \boxed{F_1 = BC + A'B = B(C+A')}$$
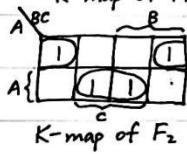
K-map of F_2

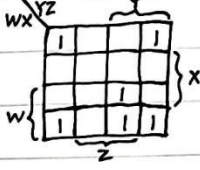$$\boxed{F_2 = \Sigma(0,2,5,7)} \qquad \boxed{F_2 = A'C' + AC = (A \oplus C)'}$$
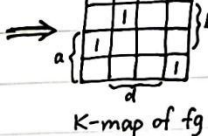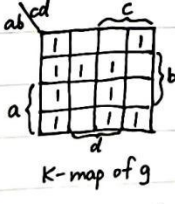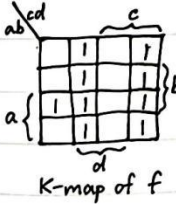
7. (a) The K-map of F is below

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

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

$$\boxed{F = X'Z' + WYZ}$$

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   K-map of fg

Hence, $fg = b'cd' + a'bc'd + abc'd' = \overline{b'cd' + (a'+a)bc'd}$

$$= b'cd' + bc'd(a'd + ad')$$

$$\boxed{= b'cd' + bc'(a \oplus d)}$$

9. The K-map of f is below.

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

(a)

$$F = \left((A'C')'(A'D)'(B'C')'(B'D)'(A'B')' \right)'$$

(b)

$$F' = \left((A+C)' + (A+D)' + (B+C)' + (B+D)' + (A+B)' \right)'$$