1) (a) $(4310)_5 = 4\times5^3 + 3\times5^2 + 1\times5^1 + 0\times5^0$

$= 4\times125 + 3\times25 + 5$

$= (580)_{10}$.

(b) $(198)_{12} = 1\times12^2 + 9\times12^1 + 8\times12^0$

$= 144 + 108 + 8$

$= (260)_{10}$.

(c) $(735)_8 = 7\times8^2 + 3\times8^1 + 5\times8^0$

$= 7\times64 + 24 + 5$

$= (477)_{10}$

(d) $(526)_6 = 5\times6^2 + 2\times6^1 + 6\times6^0$

$= 5\times36 + 12 + 6$

$= (198)_{10}$

(e) $(123)_8 = 1\times8^2 + 2\times8^1 + 3\times8^0$

$= 64 + 16 + 3 = (83)_{10}$.

(f) $(246)_8 = 2\times8^2 + 4\times8^1 + 6\times8^0$

$= 2\times64 + 32 + 6$

$= (166)_{10}$

2) $68BE = (\underbrace{0110}\ \underbrace{1000}\ \underbrace{1011}\ \underbrace{1110})_2 \rightarrow$ Binary

$= (64276)_8 \rightarrow$ octal

3) (a) $(10110.0101)_2$

$1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0 \cdot \frac{0}{2^1} + \frac{1}{2^2} + \frac{0}{2^3} + \frac{1}{2^4}$

$16 + 4 + 2 \cdot \left(\frac{1}{4} + \frac{1}{16}\right)$

$\rightarrow (22.3125)_{10}$

(b) $(16.5)_{16}$

$1\times16^1 + 6\times16^0 \cdot \frac{5}{16^1}$

$\rightarrow (22.3125)_{10}$

(c.) $(26.24)_8 = 2\times 8^1 + 6\times 8^0 \cdot \frac{2}{8^1} + \frac{4}{8^2}$

$= (16+6) \cdot (0.25 + 0.0625)$

$= (22.3125)_{10}$

(d.) $(FAFA.B)_{16} = 15\times 16^3 + 10\times 16^2 + 15\times 16^1 + 10\times 16^0 \cdot \left(\frac{11}{16^1}\right)$

$= (64250.6875)_{10}$

(e.) $(1010.1010)_2 = 1\times 2^3 + 0\times 2^2 + 1\times 2^1 + 0\times 2^0 \cdot \frac{1}{2^1} + \frac{1}{2^3}$

$= (10.625)_{10}$

(f.) $(BABA)_{16} = 11\times 16^3 + 10\times 16^2 + 11\times 16^1 + 10\times 16^0$

$= 45056 + 2560 + 176 + 10$

$= (47802)_{10}$

(g.) $(ABCD)_{16} = 10\times 16^3 + 11\times 16^2 + 12\times 16^1 + 13\times 16^0$

$= 40960 + 2816 + 192 + 13$

$= (43981)_{10}$

4.) (a.)

$$\begin{array}{r} 1011 \\ 101 \\ \hline 10000 \end{array} \qquad \begin{array}{r} 1011 \\ \times\ 101 \\ \hline 1011 \\ 000\ \ \\ 1011\ \ \ \ \\ \hline 110111 \end{array}$$

(b.)

$$\begin{array}{rr} 2E: & 0010\ 1110 \\ +\ 34: & 0011\ 0100 \\ \hline & 0110\ 0010 \end{array}$$

5.) (a.) BABA $\rightarrow$ 15's complement

$$\begin{array}{r} FFFF \\ -\ BABA \\ \hline 4545 \\ +\ 1 \\ \hline \end{array}$$

16's complement $\rightarrow$ 4546.

(b.) BABA $\rightarrow$ $(1011\ 1010\ 1011\ 1010)_2$

(c.) 2's comp. $\rightarrow$ ① 1's $\rightarrow$ 0100 0101 0100 0101

$$\begin{array}{r} 0100\ 0101\ 0100\ 0101 \\ +\quad 1 \\ \hline 0100\ 0101\ 0100\ 0110 \end{array}$$

(d.) $\underbrace{0100}_{4}\ \underbrace{0101}_{5}\ \underbrace{0100}_{4}\ \underbrace{0110}_{6}$

6.) (a.) $A'C' + ABC + AC' + AB'$

$C'(A' + A) + ABC + AB'$

$C' + ABC + AB'$

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

Q 6.

(a) $A'C' + ABC + AC' + AB'$ to two literals

Sol. $\Rightarrow \cancel{A'C'}\ C'(A'+A) + ABC + AB'$

$= C' + ABC + AB'$

$= (C+C')(C'+AB) + AB'$

$= C' + AB + AB'$

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

(b) $(x'y'+z)' + z + xy + wz$ to three ~~tee~~ literals

Sol. $(x'y')'z' + z + xy + wz$

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

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

$= z + x + y + xy + wz$

$= z(w+1) + y(x+1) + x = z + y + x.$

(c) $A'B(D' + C'D) + B(A + A'CD)$ to one literal.

$= B(A'D' + A'C'D + A + A'CD)$

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

$= B[A'D' + A'D + A]$

$= B[A' + A] = B.$

(d). $(A'+C)(A'+C')(A+B+CD)$ to four literals

Sol $= (A' + A'C + C'A' + \underbrace{CC'}_{0})(A+B+CD)$

$= A'(1+C+C')(A+B+CD)$

$= A'(A+B+CD) = A'B + A'CD.$

(e). $ABCD + A'BD + ABC'D + A'D.$ to four literals.

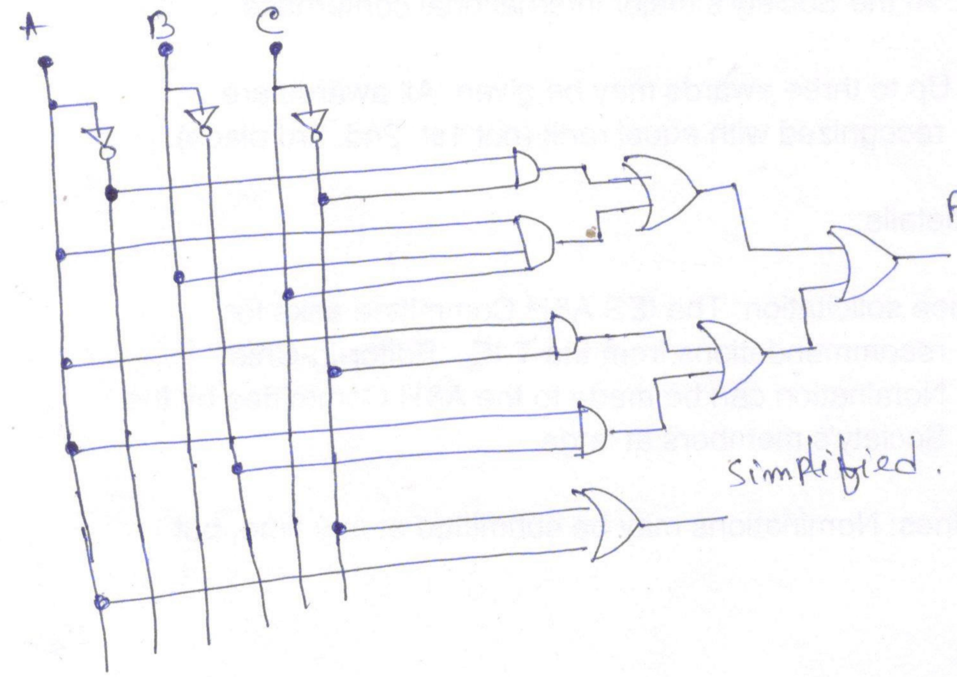
Sol $= AB(C+C')D + A'BD + A'D.$

$= ABD + A'BD + A'D.$

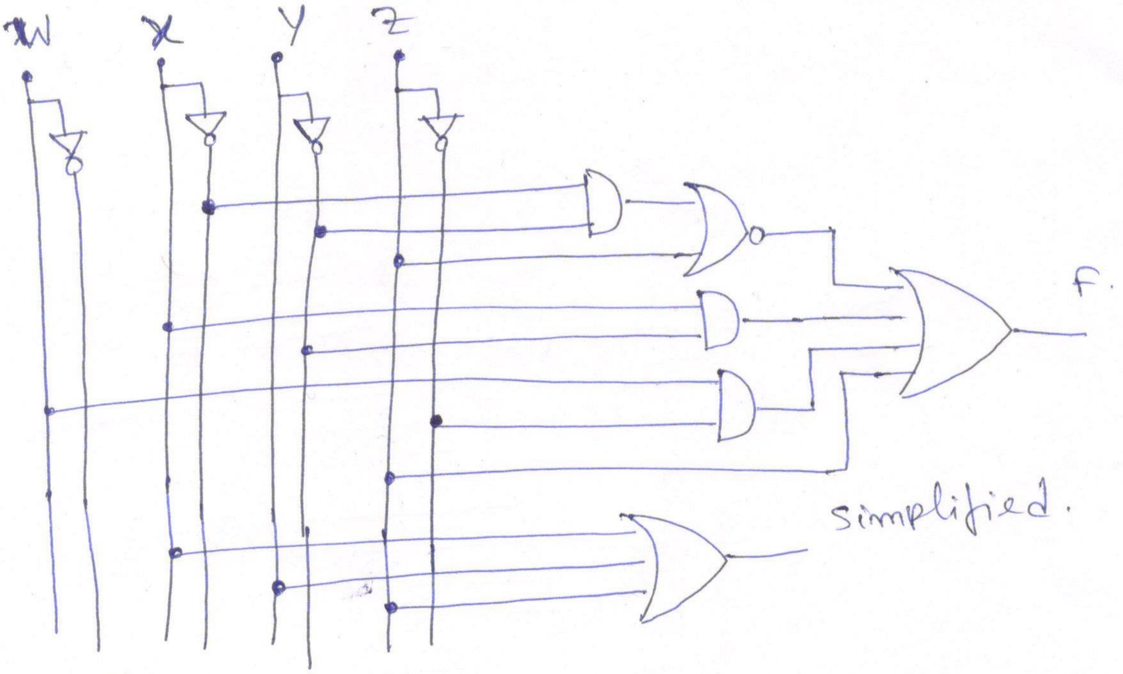
$= ABD + A'D(B+1) = ABD + A'D.$

7. Draw logic diagrams of the circuits that implement the original and simplified expressions in (6).

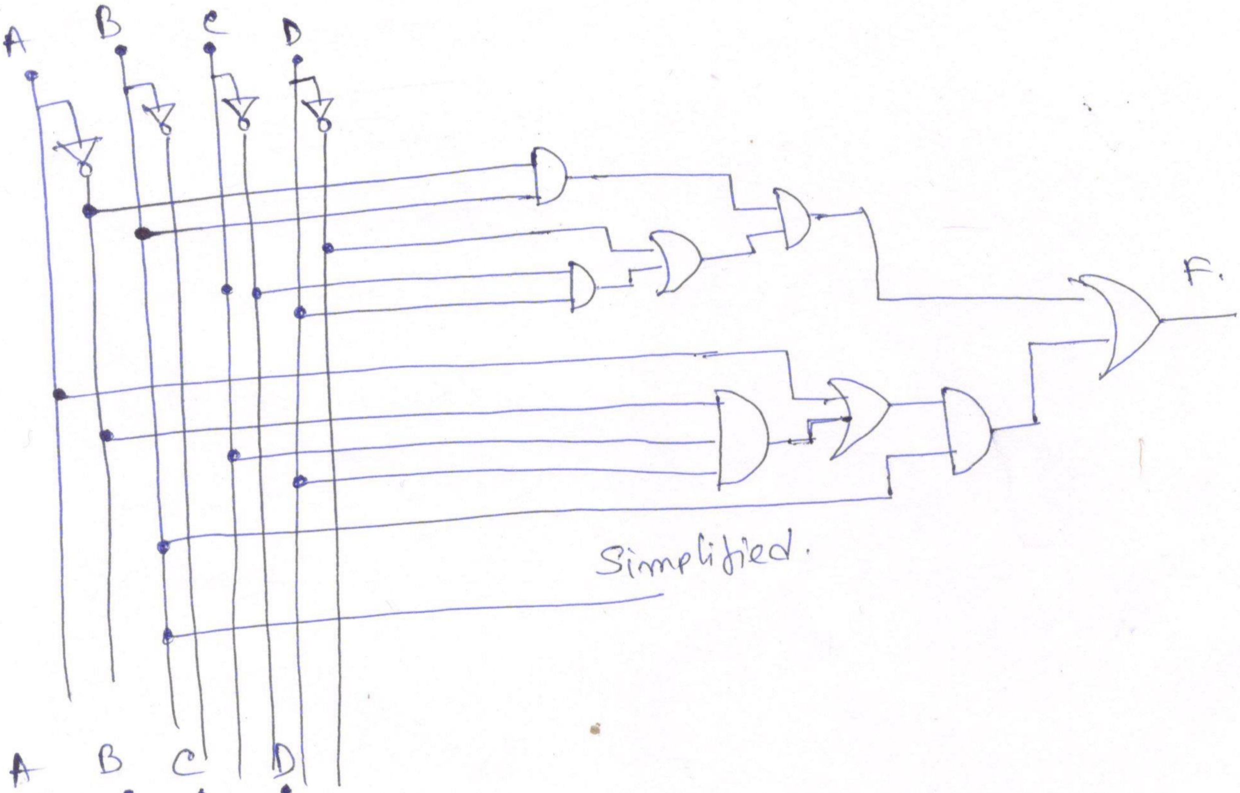
a



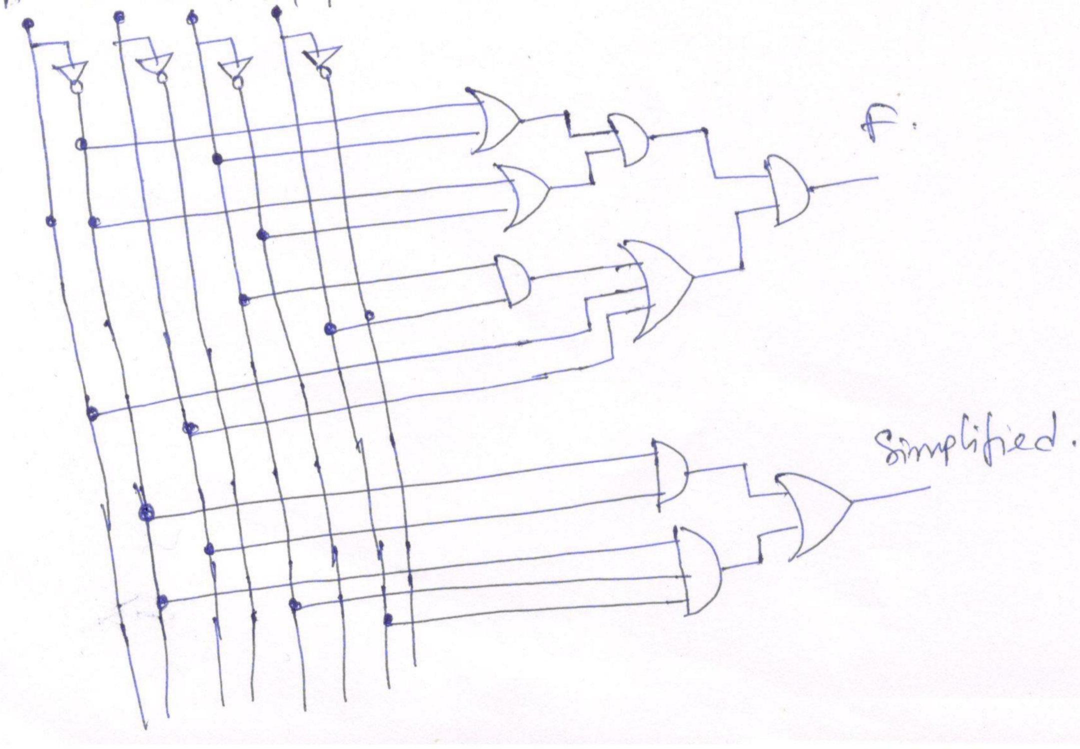
(b)



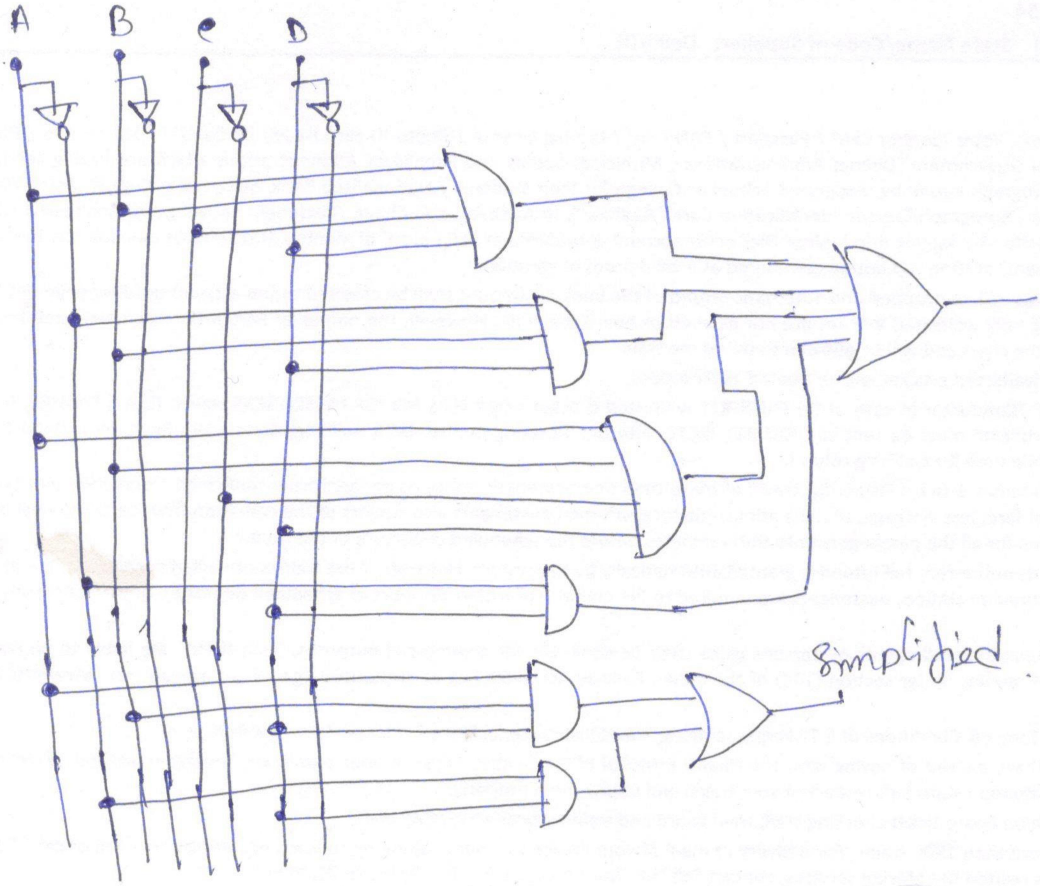
(c).



(d).



e.



8.(a) $F(A,B,C,D) = \Sigma(3,5,9,11,15)$

$F'(A,B,C,D) = \Sigma(0,1,2,4,6,7,8,10,12,13,14)$

(b) $F(x,y,z) = \Pi(2,4,5,7)$

$F'(x,y,z) = \Pi(0,1,3,6)$

$F'(x,y,z) = \Sigma(2,4,5,7)$

9.(a) $(AB+C)(B+\bar{C}D)$

$= AB + AB\bar{C}D + BC$

SOP.

$F(A,B,C,D) = AB(C+\bar{C})(D+\bar{D}) + AB\bar{C}D + (A+\bar{A})(D+\bar{D}).BC$

$= (ABC + AB\bar{C})(D+\bar{D}) + AB\bar{C}D + (ABC + \bar{A}BC)(D+\bar{D})$

$= ABCD + ABC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + AB\bar{C}D + ABCD + ABC\bar{D} + \bar{A}BCD + \bar{A}B$

$F(A,B,C,D) = ABCD + AB\bar{C}D + ABC\bar{D} + AB\bar{C}\bar{D} + \bar{A}BC\bar{D}$

POS

$F(A,B,C,D) = (\bar{A}+\bar{B}+\bar{C}+\bar{D}).(\bar{A}+\bar{B}+C+\bar{D}).(\bar{A}+\bar{B}+\bar{C}+D).(\bar{A}+\bar{B}+C+D).(A+\bar{B}+\bar{C}+$

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

$= \bar{x} + (x + x\bar{y}).(y+\bar{z})$

$= \bar{x} + xy + x\bar{z} + x\bar{y}y + x\bar{y}\bar{z}$

$= \bar{x} + xy + x\bar{z} + x\bar{y}\bar{z}$

SOP.

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

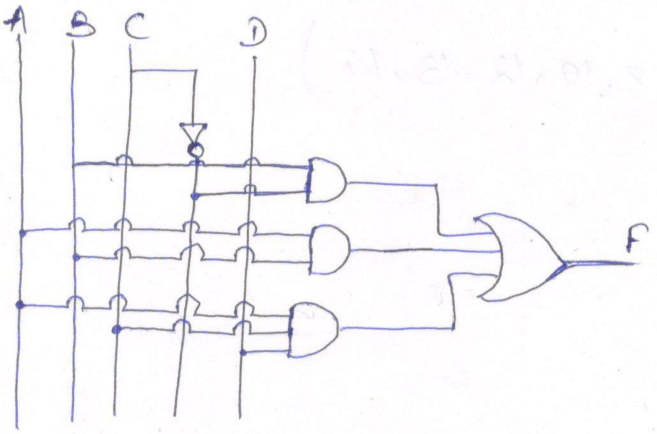
$= (\bar{x}y + \bar{x}\bar{y})(z+\bar{z}) + xyz + xy\bar{z} + xy\bar{z} + x\bar{y}\bar{z} + x\bar{y}\bar{z}$

$= \bar{x}yz + \bar{x}y\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z} + xyz + xy\bar{z} + x\bar{y}\bar{z}$

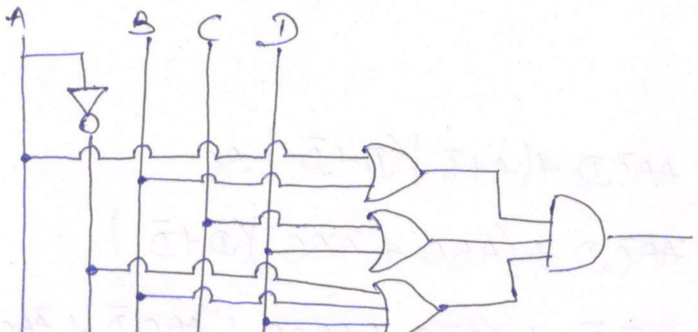
POS

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

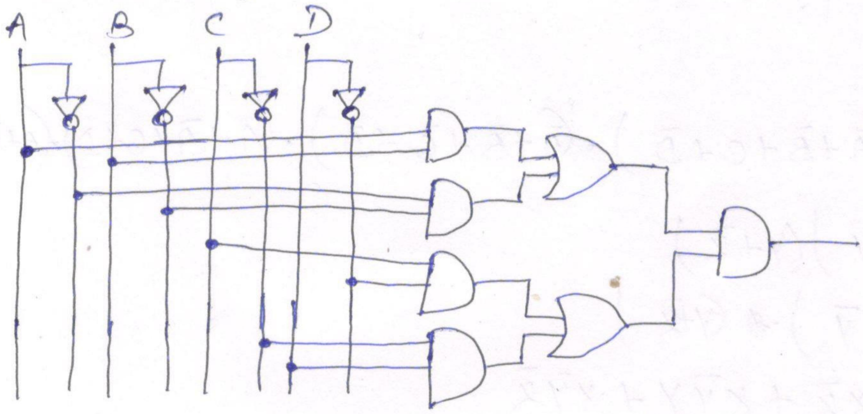
10. (a) $B\bar{C} + AB + AC\bar{D}$



(b) $(A+B)(C+D)(A'+B+D)$



(c) $(AB + \bar{A}\bar{B})(C\bar{D} + \bar{C}D)$



(d) $A + CD + (A+\bar{D})(\bar{C}+D)$