Assignment - 2

1) Design a logic circuit whose output is HIGH whenever A & B are both HIGH as long as C & D either both LOW or both HIGH.

2) The three switches are used to indicate the status of the door by the driver's seat, the ignition & the headlights respectively. Design the logic circuits with these three switches as inputs so that the alarm will be activated whenever either of the following conditions exists.
   - The headlights are ON while the ignition is off.
   - The door is open while the ignition is ON.

3) Convert the following into standard SOP
   i) $Z(A,B,C) = \bar{A}B + BC + \bar{B}\bar{C}$
   ii) $Z(A,B,C,D) = \bar{A}\bar{B} + B\bar{C}D + AB\bar{D}$

4) Convert the following into standard POS
   i) $y(A,B,C) = (A + \bar{B})(\bar{B} + \bar{C})C$
   ii) $y(A,B,C,D) = (\bar{A} + \bar{B} + D)(A + D)(\bar{B} + \bar{C})$

5) Convert the following SOP into POS
   i) $y(A,B,C) = \bar{A}BC + A\bar{B}\bar{C} + BC$
   ii) $\bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C} + A\bar{B}D + \bar{A}C\bar{D}$

6) Convert the following POS into SOP
   i) $y(A,B,C) = (\bar{A} + B + C)(\bar{B} + \bar{C})(\bar{A} + C)$
   ii) $y(A,B,C,D) = (A + \bar{B} + \bar{C})(\bar{B} + C + \bar{D})(\bar{A} + B + D)$

7) Simplify the following using K-map method
   7) $F(P,Q,R,S) = \Sigma m(0, 2, 5, 7, 8, 10, 13, 15)$
   8) $F(A,B,C,D) = \Sigma m(3, 7, 11, 12, 13, 14, 15)$
   9) $F(P,Q,R,S) = \Pi M(3, 5, 7, 8, 10, 11, 12, 13)$
   10) $F(A,B,C,D) = \Pi M(0, 1, 2, 4, 5, 6, 8, 9, 10)$

11) $f(A,B,C,D) = \Sigma m(1,3,4,6,8,9,11,13,15) + d(0,2,14)$

12) $f(A,B,C) = \Sigma m(1,2,5,7) + d(0,4,6)$

13) $f(A,B,C,D) = \Sigma m(0,2,8,10,14) + d(5,15)$

14) $f(A,B,C,D) = \Pi M(0,2,4,8,10,12) + d(3,5,9,13,15)$

15) $f(A,B,C) = \Pi M(0,5,7) + d(1,3,4)$

16) $f(A,B,C) = \Pi M(1,2,5,6,9,10) + d(11,12,13,14)$

17) $F(A,B,C) = \bar{A}\bar{B}\bar{C} + \bar{A}B + AB\bar{C} + AC$

18) $F(A,B,C) = \bar{A}B + B\bar{C} + BC + A\bar{B}\bar{C}$

19) $Out = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}D + \bar{A}BCD + ABCD + ABC\bar{D} + A\bar{B}\bar{C}\bar{D} + A\bar{B}C\bar{D}$

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

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

22)

A	B	C	D	Z
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	X
0	1	1	1	X
1	0	0	0	1
1	0	0	1	0
1	0	1	0	X
1	0	1	1	X
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1