2011 Midterm

Q1. Boolean Algebra

i) $xy + z\bar{y} + xz = xy + z\bar{y}$

LHS. $xy + z\bar{y} + xz(y+\bar{y})$

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

$= xy(1+z) + \bar{y}z(1+x)$

$= xy + \bar{y}z$

$= R.H.S.$

consensus rule 17 a.b.

ii) $\bar{w}x\bar{y} + \bar{w}xz + \bar{w}yz + w\bar{y}z + wxy + wxz$

$= \bar{w}x\bar{y} + \bar{w}yz + w\bar{y}z + wxy$

$LHS = \bar{w}(x\bar{y} + xz + yz) + w(\bar{y}z + xy + xz)$

$= \bar{w}x\bar{y} + \bar{w}yz + w\bar{y}z + wxy$

consensus rule

Q2. number conversion

i) $(200)_{10} = 128 + 64 + 8 = 2^7 + 2^6 + 2^3 = (11001000)_2$ (7th, 6th, 3rd, 0th)

ii) $(25600)_{10} = (128 \times 200)_{10} = 2^7(2^7 + 2^6 + 2^3) = (2^{14} + 2^{13} + 2^{10})_{10}$

$= (1100100000000000)_2$

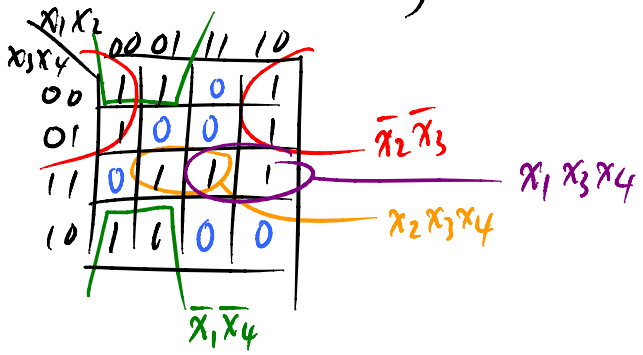
iii) $(612)_{10} = (512 + 100)_{10} = 2^9 + (64 + 32 + 4)_{10} = 2^9 + 2^6 + 2^5 + 2^2$

$= (1001100100)_2$

$(2 \quad 6 \quad 4)_{16}$

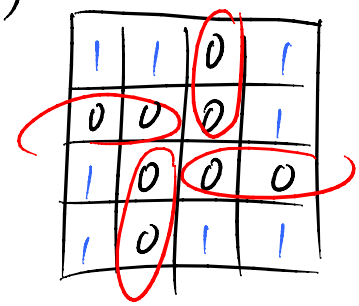
Q3. K-maps

i)

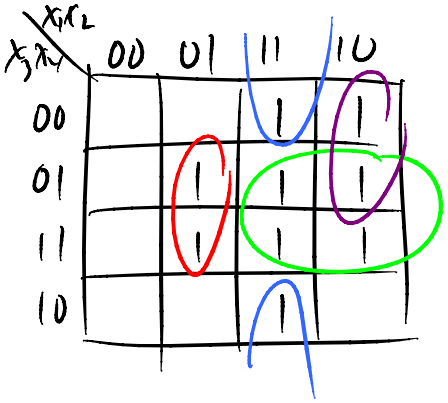


ii) 3 possible min-cut SOP's.

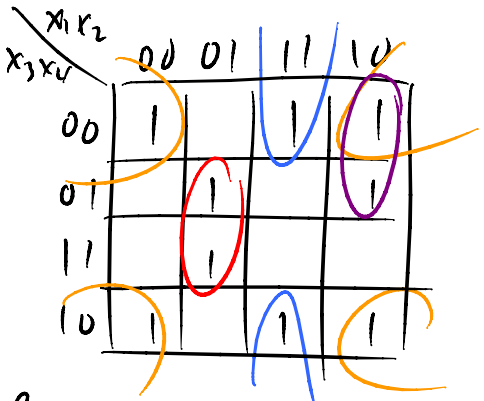
iii)



iv)

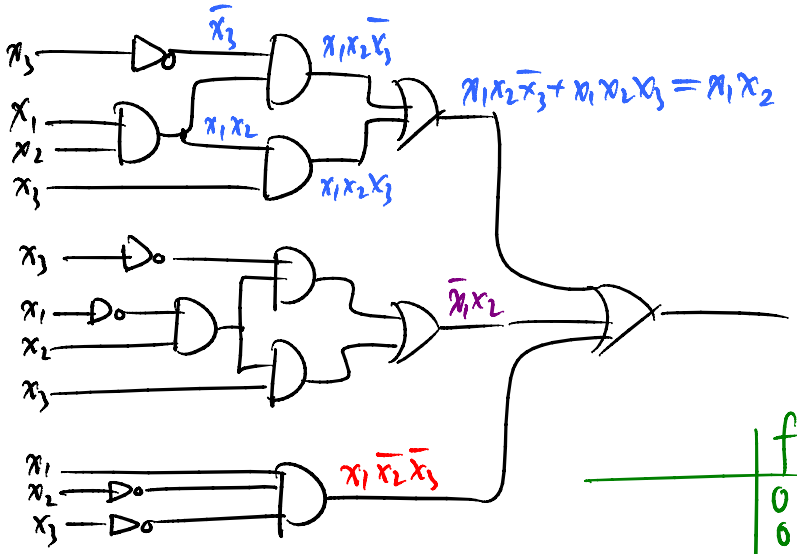


$f = \bar{x}_1 x_2 x_4 + x_1 x_2 \bar{x}_4 + x_1 \bar{x}_2 \bar{x}_3 + x_1 x_4$



$g = \bar{x}_1 x_2 x_4 + x_1 x_2 \bar{x}_4 + x_1 \bar{x}_2 \bar{x}_3 + \bar{x}_2 \bar{x}_4$

Q4.

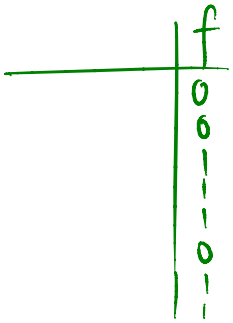


$x_1x_2 + \bar{x}_1x_2 + x_1\bar{x}_2\bar{x}_3$

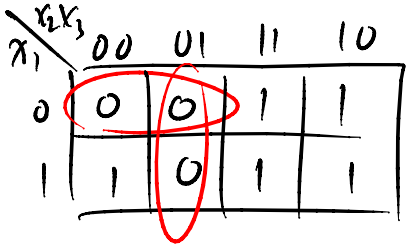
$x_2 + x_1\bar{x}_2\bar{x}_3$

$x_2 + x_1\bar{x}_3 = f$

i)

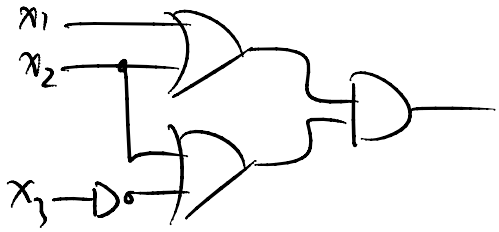


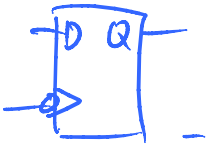
ii)



pos $f = (x_2 + \bar{x}_3)(x_1 + x_2)$

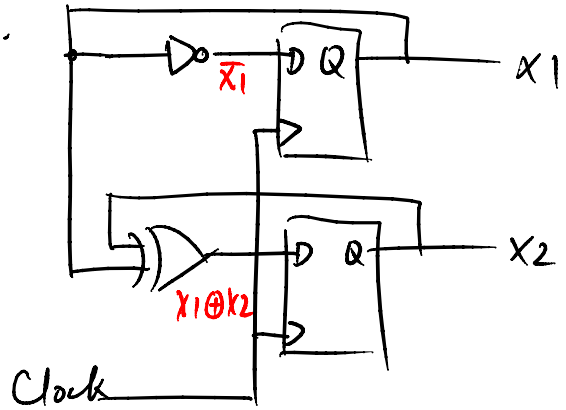
iii)

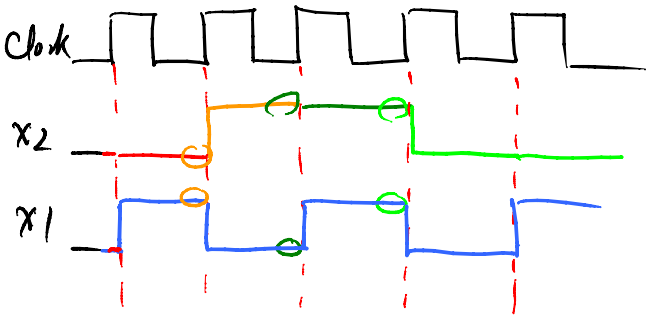




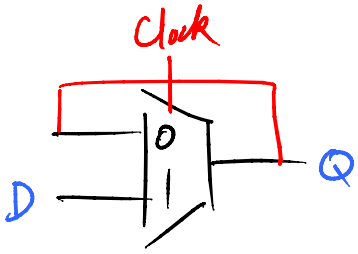
-ve triggered D-ff.

Q5.

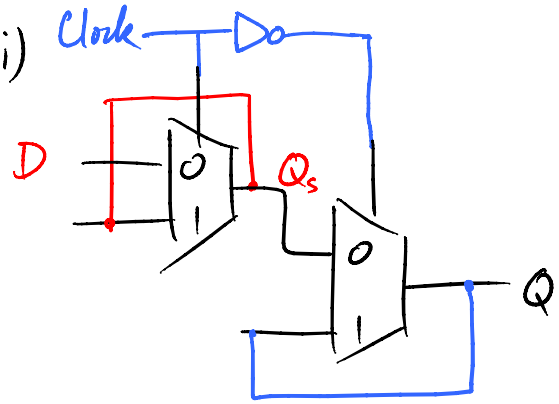

$\bar{x}_1$
D Q
x_1
D Q
x_2
$x_1 \oplus x_2$
Clock


Clock
x_2
x_1

Q6 i)


Clock
0
1
D
Q

ii)


Clock
D
0
1
Q_s
0
1
Q