**1) a)** Signed 8-bit binary numbers covers **-**12810 to +12810

B=(11100001)2 is negative since its MSB is 1. B’+1=0001 1111 B=(24+23+22+21+20)x(-1)

B=(**-**31)10

If A**-**(**-**31)=**-**129, or A**-**(**-**31)=129, there will be overflow.

A=-160 out of range(9 digit), so A can be minimum (**-**128)10= 100000002 in order to get valid result

A=98 in second case (01100010)2, as maximum value.

**b)** Unsigned 8-bit binary numbers covers 0 to 25510

B=(11100001)2=22510

If A**-**225=**-**1, or A**-**225=256, there will be overflow

A=224=111000002 as minimum

A=481, out of range(9 digit), so A can be maximum (255)10= 111111112

**2) a)**

(a+E)(a’+F) Expression in POS form | aE+a’F Dual of this expression

(a+E)(a’+F)(E+F) = (a+E)(a’+F) Consensus theorem assumes that equation

aE+a’F+EF = aE+a’F Dual of previous equation

aE+a’F+(a+a’)EF = aE+a’F Consensus term is multiplied with (a+a’)

aE+a’F+aEF+a’EF = aE+a’F Distribution

aE+aEF+a’F+a’EF = aE+a’F

aE(1+F)+a’F(1+E) = aE+a’F Absorbsion

aE~~(1+F)~~+a’F~~(1+E)~~ = aE+a’F Dominance

aE+a’F = aE+a’F

(a+E)(a’+F)(E+F) = (a+E)(a’+F) is also true(provable), since its dual is true.

**2)b)**

(a+E)(a’+F)(E+F) = (a+E)(a’+F) Consensus theorem

(aE+aF+E~~E~~+EF)(a’+F) = ~~aa’~~+aF+a’E+EF aa’=0 (inverse), EE=E

(aE+aF+E~~(1+F)~~)(a’+F) = aF+a’E+EF

aa’E+aFF+a’E+EF = aF+a’E+EF

~~aa’E~~+aF~~F~~+a’E+EF = aF+a’E+EF

aF+a’E+EF = aF+a’E+EF Both sides are equal

E=(b’c+d) | F=(bc+bd)

a(bc+bd)+a’(b’c+d)+(b’c+d)(bc+bd) = a(bc+bd)+a’(b’c+d)+(b’c+d)(bc+bd)