EXAM 1: ECE 6140 FALL 2011
NAME: CHATTERJEE SOLUTIONS
GT ID NO:

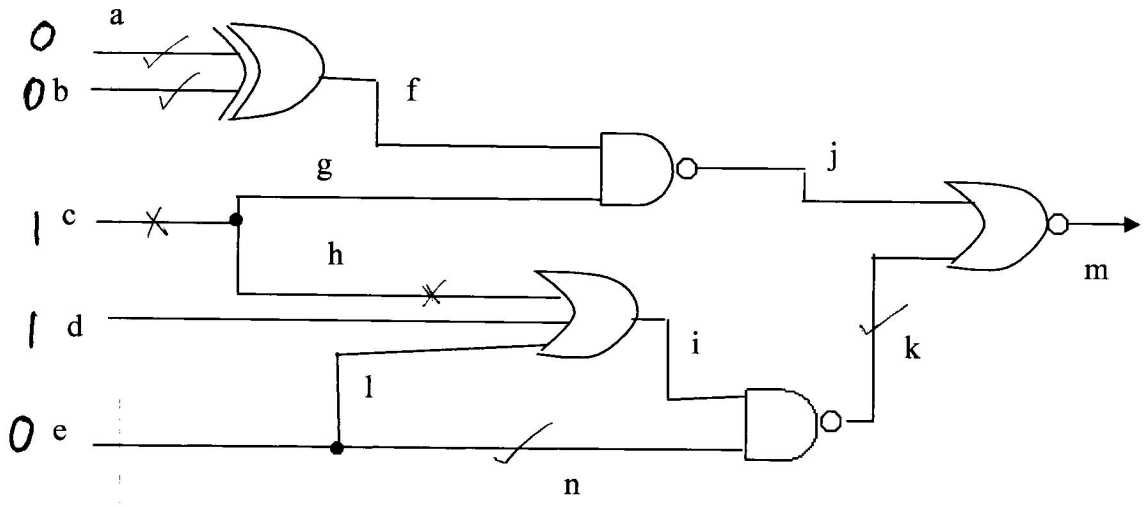


Figure 1. Test Ckt.

Prob 1 (20 points): For the fault set {a1,b1,c0,h0,n1,k1} (e.g. h0 = line h stuck at 0, h1 = line h stuck at 1), use a 7 bit word to perform parallel fault simulation with the input vector V = 00110 = abcde. Write down the I and S vectors for each line as well as the simulation vector Z *after* fault injection. Assume that each word represents the faults [a1,b1,c0,h0,n1,k1, fault-free] in that (the same) sequence. Which faults are detected by this test ?

Ia = 1000000
Sa = 1000000
Za= 1000000

Ib= 0100000
Sb= 0100000
Zb= 0100000

Ic= 0010000
Sc= 0000000
Zc= 1101111

Id= 0000000
Sd= 0000000
Zd= 1111111

Ie= 0 0 0 0 0 0 0
Se= 0 0 0 0 0 0 0
Ze= 0 0 0 0 0 0 0

Il= 0 0 0 0 0 0 0
Sl= 0 0 0 0 0 0 0
Zl= 0 0 0 0 0 0 0

In= 0 0 0 0 1 0 0
Sn= 0 0 0 0 1 0 0
Zn= 0 0 0 0 1 0 0

If= 0 0 0 0 0 0 0
Sf= 0 0 0 0 0 0 0
Zf= 1 1 0 0 0 0 0

Ig= 0 0 0 0 0 0 0
Sg= 0 0 0 0 0 0 0
Zg= 1 1 0 1 1 1 1

Ih= 0 0 0 1 0 0 0
Sh= 0 0 0 0 0 0 0
Zh= 1 1 0 0 1 1

Ii= 0 0 0 0 0 0 0
Si= 0 0 0 0 0 0 0
Zi= 1 1 1 1 1 1

Ij= 0 0 0 0 0 0 0
Sj= 0 0 0 0 0 0 0
Zj= 0 0 1 1 1 1

Ik= 0 0 0 0 0 1 0
Sk= 0 0 0 0 0 0 0
Zk= 1 1 1 1 0 1 1

Im= 0 0 0 0 0 0 0
Sm= 0 0 0 0 0 0 0
Zm= 0 0 0 0 0 0 0

The following faults are detected = ϕ None

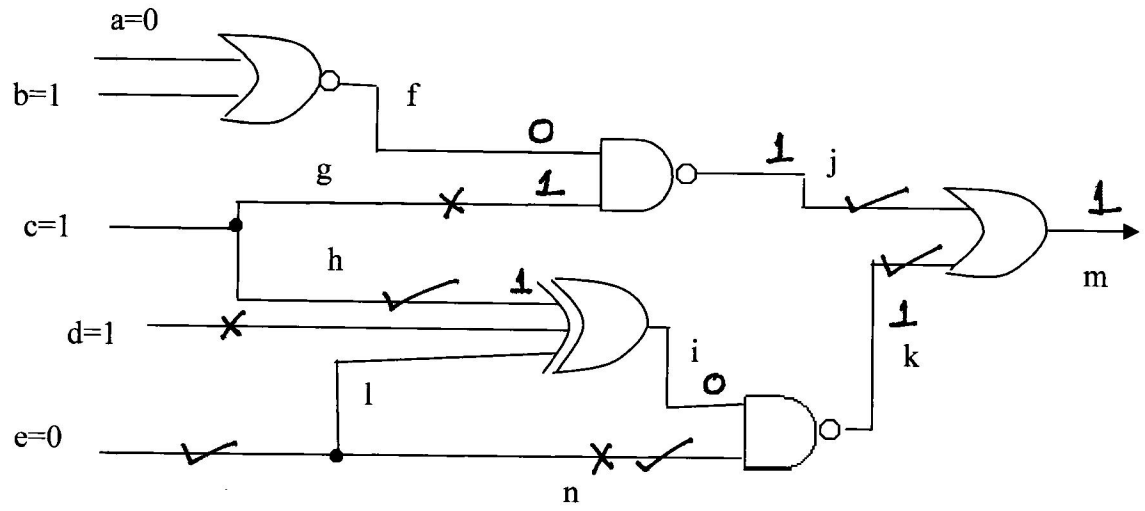


Figure 2. Test Ckt.

Prob 2 (20 points): Perform deductive fault simulation for the circuit of Figure 2 with V=01110=abcde and the fault set {d0,e1,g0,n0,n1,[redacted],h1,j1,k1} Give equations showing how each fault list was computed and the final set of detected faults. *Do not consider any faults that are not in the fault list above.*

La= $\{\phi\}$

Lb= $\{\phi\}$

Lc= $\{\phi\}$

Ld= $\{d_0\}$

Le= $\{e_1\}$

Ll= $\{e_1\}$

Ln= $\{e_1, n_1\}$

Lf= $\{\phi\}$

Lg= $\{g_0\}$

Lh= $\{\phi\}$

Li= $\{e_1, d_0\} = L_f \cup L_d \cup L_h$ (this is case specific) If the same fault appears on 2 inputs, it is dropped.

Lj= $L_f - L_g = \{\phi\}$

Lk= $L_i \cap L_n = \{e_1\}$

Lm= $L_j \cap L_k = \{\phi\}$

The following faults are detected: ϕ {NULL} NONE.

HADA HYET.

Prob 3 (20 points): For the circuit of Figure 3 (problem has 3 parts):

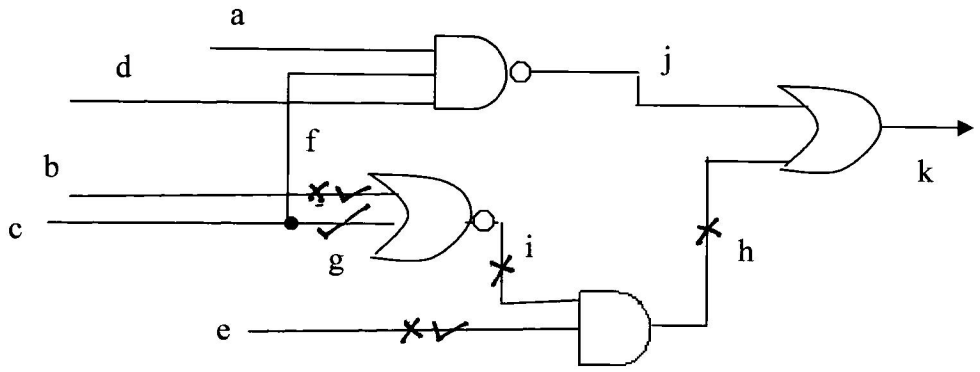
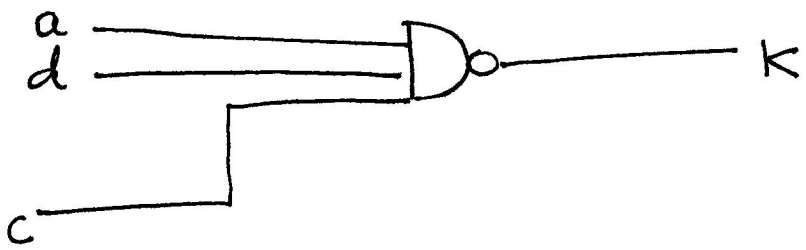


Figure 3. Test Ckt.

(a) Identify as many redundant faults in the above circuit as possible. Your must consider stuck at 0 and stuck at 1 faults on the lines a,b,c,d,e,f,g,h,i,j,k above and determine those which are redundant.

$g_1, i_0, h_0, b_1, e_0, b_0, e_1$

(b) Reduce the circuit to its simplest form possible based on the redundancies you have identified



(c) If you were to use the checkpointing theorem directly on the circuit of Figure 3, which faults would you target ?

$a_0, a_1, b_0, b_1, c_0, c_1, e_0, e_1, f_0, f_1, g_0, g_1, d_0, d_1$

$\Rightarrow \{a_0, a_1, d_1, f_1, b_0, c_0, c_1, g_0, g_1, e_1\}$