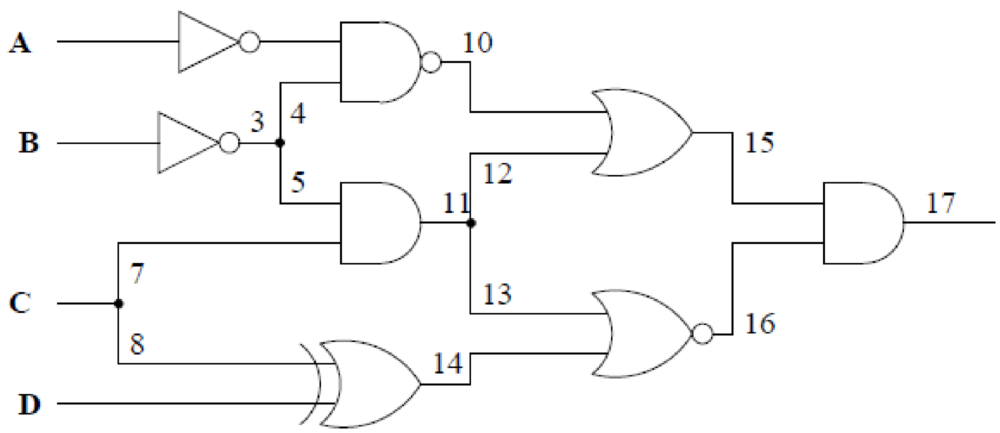
Assignment -3 (COMSM0125)

Due on 11th Dec 2014

1. Suppose that a simplex (no redundancy) computer system has a failure rate of λ and fault detection coverage of C. The fault detection capability is the result of self-diagnostics that are run continuously. If the self-diagnostics detects a fault, the time required to repair the computer system is 24 hours because the faulty board is identified, obtained overnight and easily replaced. If, however, the self-diagnostics do not detect the fault, the time required to repair the system is 72 hours because a repair person must visit the site, determine the problem and perform the repair. The disadvantage of including self-diagnostics however is that the failure rate of computer system becomes $\alpha\lambda$. In other words, the failure rate is increased by a factor of α because of the addition of the self-diagnostics. Draw Markov model for the system. Determine the value of α for coverage of 0.95 at which including diagnostics begins to degrade the steady-state availability of the system. Note all the repair times given in the problem are MTTRs. **(10 Points)**

2.

(a) For the circuit shown in Fig. find a test for each of the following single stuck-at faults (i) Line 4 stuck-at 0 (ii) Line 13 stuck-at-1 (iii) input B stuck-at-0 .



(10 point)

3. Assume the process yield (*Y*) is 90% and the device's fault coverage (*FC*) is 80%, 90%, or 99%, calculate their respective defect levels in terms of defective *parts per million* (PPM). Also compute the required fault coverage (FC): Given DL = 20 DPM and Y = 0.6;

(5 Point)

4. Truth table for fault-free circuit and all possible transistor faults for 2 input NOR gate is shown in Table. Generate similar table for 2 input NAND gate.

AB	00	01	10	11
Z	1	0	0	0
N_1 stuck-open	1	0	last Z	0
N_1 stuck-short	I_{DDQ}	0	0	0
N_2 stuck-open	1	last Z	0	0
N_2 stuck-short	I_{DDQ}	0	0	0
P_1 stuck-open	last Z	0	0	0
P_1 stuck-short	1	0	I_{DDQ}	0
P_2 stuck-open	last Z	0	0	0
P_2 stuck-short	1	I_{DDQ}	0	0

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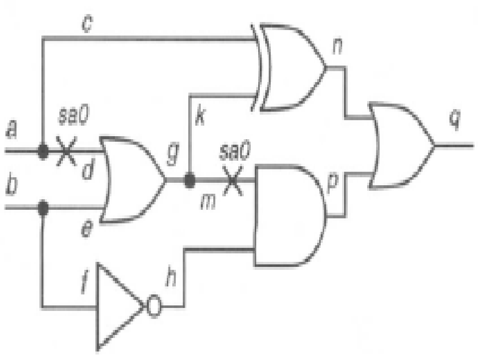
(10 Point)

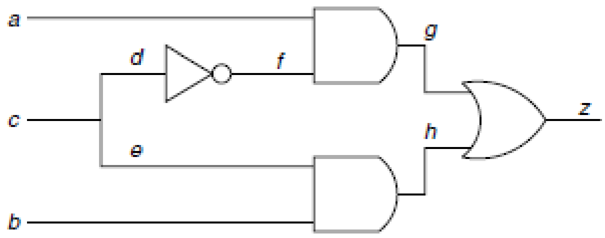
5. Find tests for : (1) The single fault d sa0 and (2) The single fault m sa0. Show the test pattern and the fault effect at q if the fault is testable. If any of these faults is redundant, remove the redundancy and re-examine the other fault. What is the Boolean function of the circuit and how could you obtain its minimal implementation?



(10 Point)

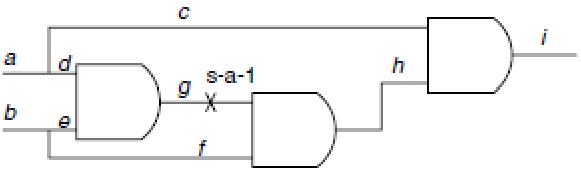
6. Using the circuit shown in Figure, compute the set of all vectors that can detect each of the following faults using Boolean difference:
   i. line ***a*** s-a-1
   ii. line ***h*** s-a-0

iii. line ***h***-s-a-1
iv. line e -s-a-0
v. line e -s-a-1
vi. line c -s-a-0



(10 Point)

7. Using the circuit shown in Figure, compute the
set of all vectors that can detect each of the following faults using Boolean difference:
a. a/1
b. d/1
c. g/1



(10 Point)

(8) Compute the signature of the SISR (single-input signature register***)*** given in Figure for a faulty free sequence M = {10011011} (fault free). Compute the signature faulty sequence M' = 11111111. Explain why M' is detected or not detected.
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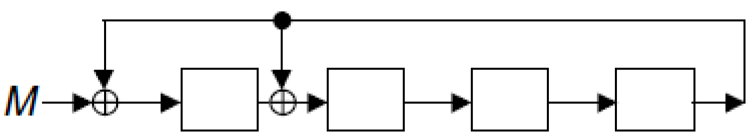

(10Point)