

April 24, 2003

COMPUTER ENGINEERING DEPARTMENT

COE 545

Digital System Testing

Major Exam I

Second Semester 2003 (022)

Time: 3:30-5:30 PM

Student Name : _____

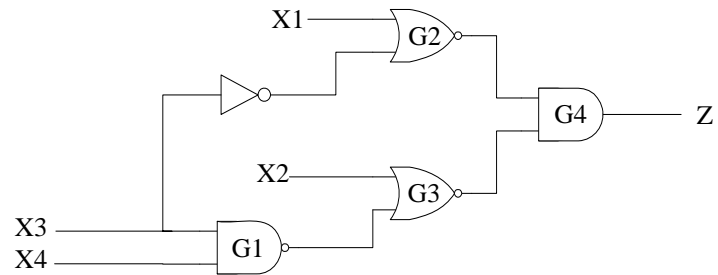
Student ID. : _____

Question	Max Points	Score
I	15	
II	20	
III	40	
IV	25	
Total	100	

Dr. Aiman El-Maleh

[15 Points]

(I) Given the circuit shown below:



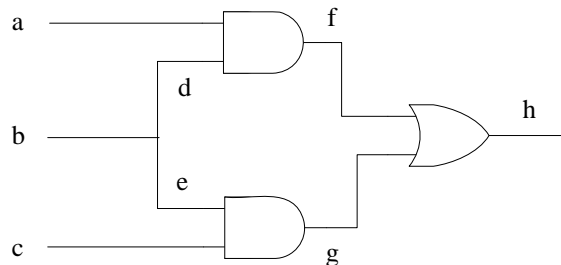
(a) Find a Boolean expression for the set of all tests that detect the fault:

1. AND bridge between the inputs of gate G2.
2. The multiple fault {X3 s-a-1, X2 s-a-0}.

(b) Find a Boolean expression for the set of all tests that distinguish between the faults X1 s-a-0 and X3 s-a-1.

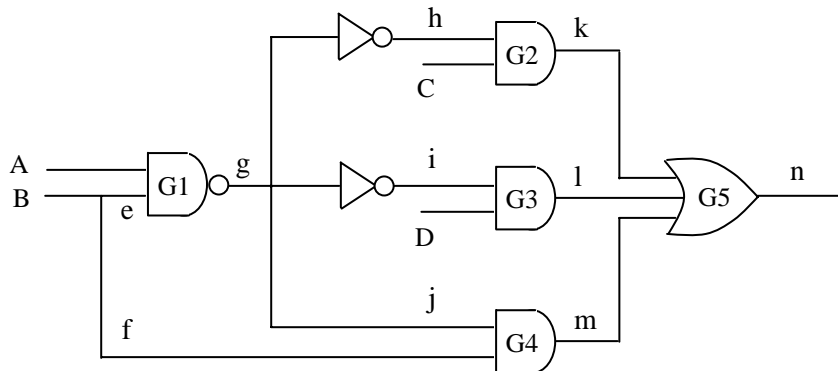
(II) Consider the circuit shown below with the collapsed fault list:

{a1, b0, b1, c1, d0, d1, e0, e1}



- Find a minimal and complete detection test set that detects all the faults in the circuit.
- Find a minimal and complete location test set that distinguishes between every pair of distinguishable faults in the circuit. Derive the fault dictionary for the circuit.

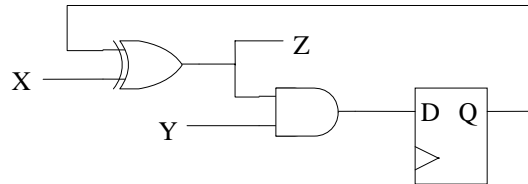
(III) Consider the circuit shown below:



- Starting with injecting faults on each line in the circuit, perform fault collapsing based on fault equivalence and dominance relations.
- Starting with the set of faults based on the checkpoint theorem, perform fault collapsing based on fault equivalence and dominance relations.
- Considering the list of faults obtained in (a), perform deductive fault simulation of the test vector $ABCD=0111$ and determine the detected collapsed faults. Show all the details.
- Considering the list of faults obtained in (a), perform critical path tracing of the test vector $ABCD=0111$ and determine the detected collapsed faults. Show all the details.

[25 points]

(IV) Consider the sequential circuit shown below, where X and Y are primary inputs and Z is a primary output:



- Show an iterative array model of three time frames for this circuit.
- Determine whether the fault Q s-a-0 is detectable, strongly detectable, partially testable or redundant. If the fault is testable, derive a test sequence for it.
- Determine whether the fault Y s-a-1 is detectable, strongly detectable, partially testable or redundant. If the fault is testable, derive a test sequence for it.

