

May 17, 2008

COMPUTER ENGINEERING DEPARTMENT

COE 571

Digital System Testing

Major Exam II

Second Semester (072)

Time: 8:00-10:30 PM

Student Name : _____

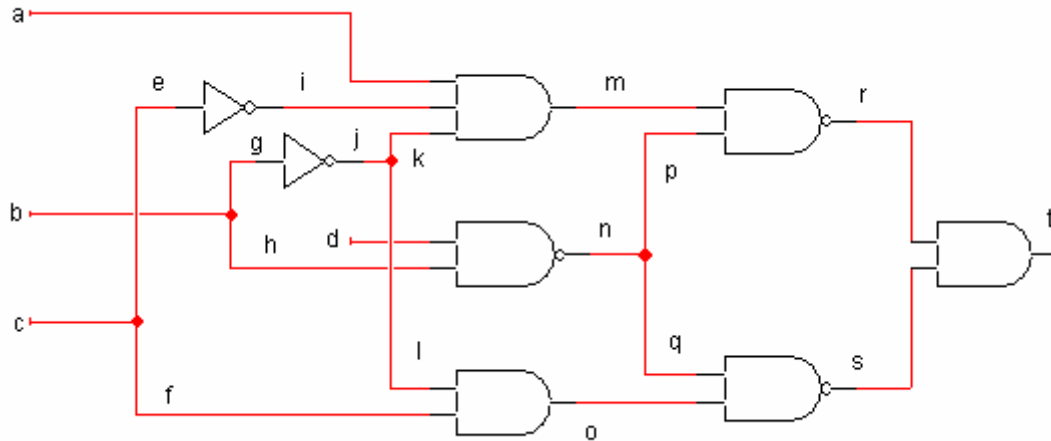
Student ID. : _____

Question	Max Points	Score
Q1	70	
Q2	10	
Q3	20	
Total	100	

Dr. Aiman El-Maleh

[70 Points]

(Q1) Consider the circuit shown below with four primary inputs, a, b, c and d, and one primary output t:



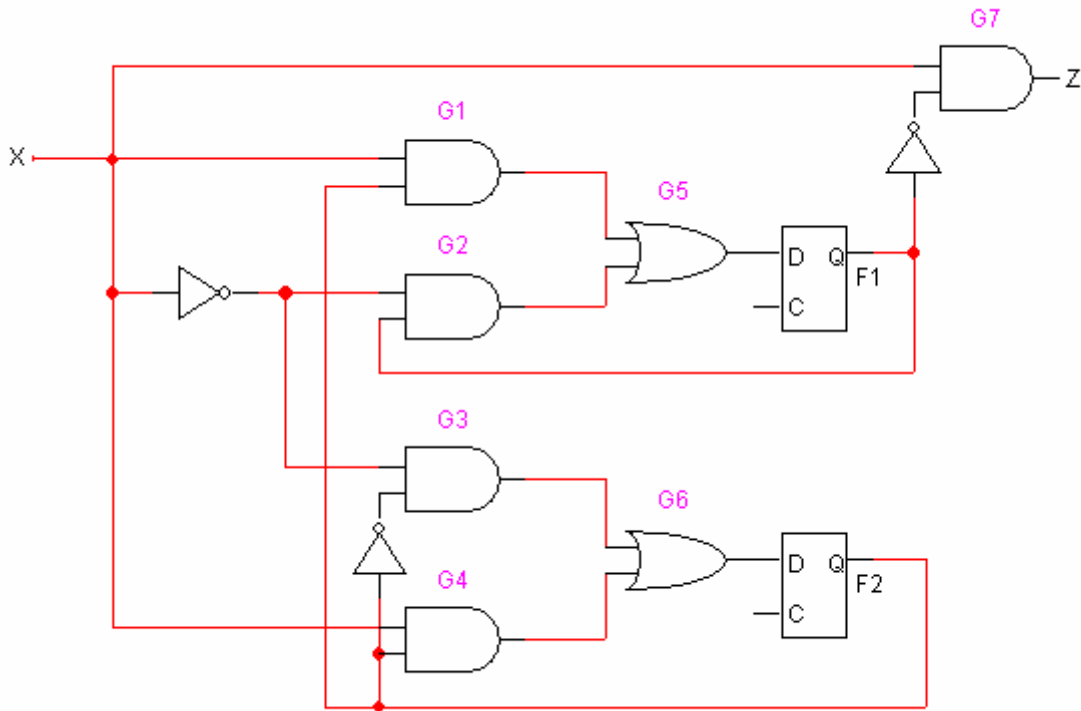
- (i) Compute the **controllability** and **observability** costs for every line in the circuit using fanout-based recursive functions.
- (ii) Determine a lower bound on the detection probability of the fault *f stuck-at 0* based on the cutting algorithm.
- (iii) What is the exact detection probability of the fault *f stuck-at 0*?
- (iv) Based on the exact fault detection probability of the fault *f stuck-at 0*, what is the length of random test patterns required such that the escape probability of the fault *f stuck-at 0* is less than or equal to 0.05?
- (v) Generate a test for the fault *c stuck-at 0* using the **D algorithm**. Show all the details of the algorithm including the D-Frontier, the J-Frontier and the Decision tree. Whenever there are choices, select the choices according to the cost functions computed in (i).
- (vi) Generate a test for the fault *i stuck-at 1* using the **PODEM algorithm**. Show all the details of the algorithm including the D-Frontier and the Decision tree. Whenever there are choices, select the choices according to the cost functions computed in (i).

[10 points]

(Q2) Determine the **primitive cubes** and the **propagation D-Cubes** for the majority function **$F=ab+ac+bc$** .

[20 points]

(Q3) Consider the sequential circuit shown below, which has two D-FFs, F1 and F2, a single primary input X and a single primary output Z:



- (i) Generate a minimal-length test sequence for detecting the single fault **Z stuck-at-0** assuming the reset state $F1=F2=1$.
- (ii) Generate a minimal-length self-initializing test sequence for detecting the single fault **Z stuck-at-0**.

