EECS 579 Homework No.3

This assignment covers material from the lectures and the text Chapters 7 and 8.

Problem 1 (20 points) *Boolean difference*

(a) Consider the 5-input circuit appearing in Fig. 7.30, page 197 of the text. Use the Boolean difference method discussed in class to derive the set of all tests T that detect the fault F_1 = line *e* stuck-at-1. (This is little *e*, not to be confused with the line labeled big *E.)* Give your answer in the form of a minimal sum-of-products (SOP) expression representing T.

(b) Suppose the above circuit is modified by converting internal line *k* into a primary output (PO), e.g., by allowing the ATE to probe the signal on *k* during testing. This effectively creates a new circuit *C** with two PO's *k* and *n*. Use the Boolean difference technique to find all tests T^* that detect the same fault F_1 in C^*. Again give your answer in the form of a minimal SOP expression.

Problem 2 (10 points) *PODEM*

Text, Page 209, Problem 7.20. Give your answer in the tabular style illustrated in the solution handed out for Homework 2, Problem 7(b). Also draw the decision tree used in your solution.

Problem 3 (20 points) *FAN*

Text, Page 209, Problem 7.22. Note that line *k* is considered a headline. Give your answer as a sequence of steps using the following tabular format. Table entries should be neat and clear, as in the example below.Your comments should note the use of FAN procedures that are not present in PODEM

Step	**Objective**	**Decision and Implications**	**Explanatory Comments**
i	Prop. fault effect from *p* to *q*	*a*=1,*b*=0,...	D frontier becomes empty. Backtrack.

Problem 4 (10 points) *Serial adder*

Text, Page 249, Problem 8.4.

Problem 5 (20 points) *Sequential circuit testing*

(a) The sequential circuit shown *N* in Fig. 1 has one primary input *x* and one primary output *z*. Construct two state tables for this circuit, one with no faults present, and the other with the fault D_2 s-a-1 present. Label your states A,B,C,D corresponding to y_1y_2 = 00,01,10,11, respectively.

(b) Derive a minimal-length test for this fault assuming that the initial state is y_1y_2 = 00.

(c) Derive a minimal-length test for this fault assuming that the initial state is unknown.

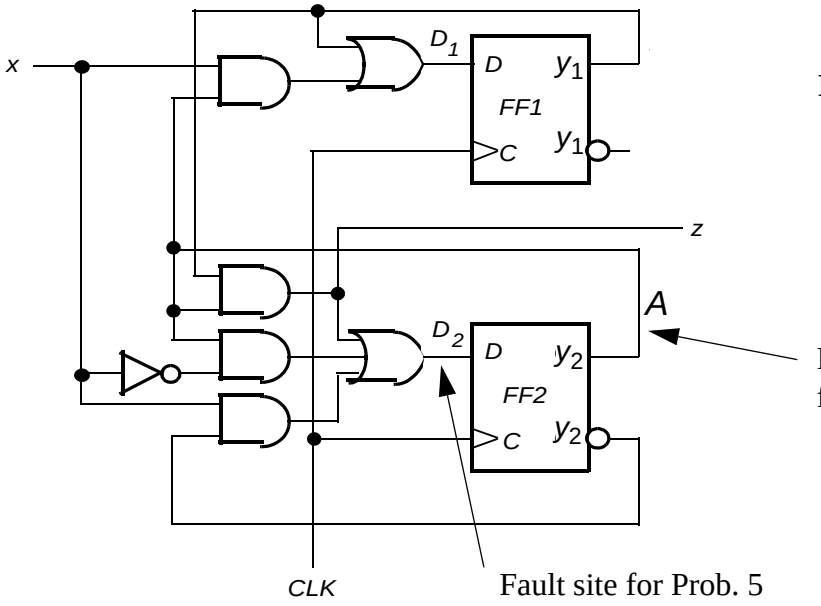

Fig. 1

Problem 6 (20 points) *Sequential PODEM*

(a) Consider again the circuit *N* in Fig. 1. Use basic PODEM and time-frame expansion to derive a test for the fault *A* stuck-at-1 in *N*, assuming that testing begins in the known initial state y_1y_2 = 00. Give your answer by filling in the usual PODEM-style table with comments to explain the action associated with, or reason for, each step.

(a) Repeat Part (a) of the problem, this time assuming that the initial state is unknown.

End of Homework No. 3 (6 problems, 100 points)