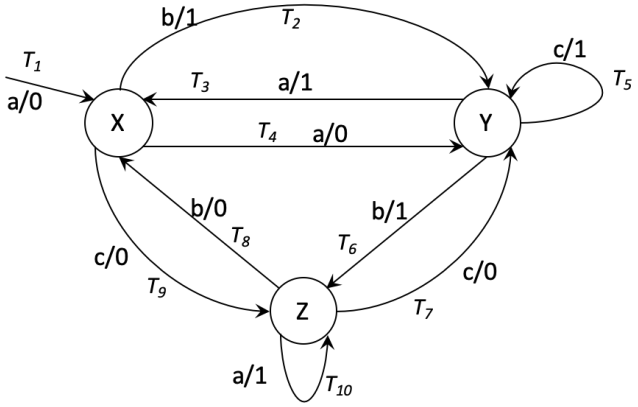
SYSC 4101

Laboratory 7

Consider the Finite State Machine below. The notation on transitions reads m/n where m (either a, b or c) is the input firing the transition and n (either 0 or 1) is the output produced when the transition fires. Each transition also has a name for easy reference: T_1, … T_{10}. For instance, if input b is received while in state X, then transition T_2 from X to Y is fired, producing output 1.



Exercise 1 (15 pts)

For each question below, you are asked to provide the following information:

1. A list of paths, each path being a sequence of named transitions, i.e., using names T_1 to T_{10}.
2. For each path, format the information on named transitions, sequence of states, sequence of inputs and outputs, sequence of reached states as follows:

	Steps in test path			
	T_1	T_2	T_3	…
Source state	Ø	X	Y	
Input	a	b	a	
Output	0	1	1	
Destination state	X	Y	X	

In this table, the path starts with transitions T_1, T_2, T_3. When the test starts the initial state if denoted as Ø. Looking at transition T_1, the table indicates a start state of Ø; the input a leads to reaching state X and producing output 0. From there, transition T_2 fires, which makes the state machine go from state X to state Y on input b, producing output 1 …

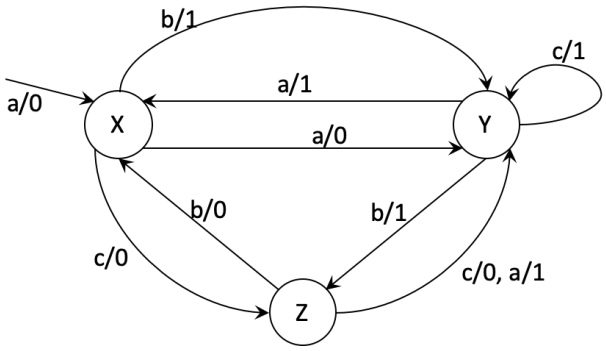
Question 1 (5 marks): Create a test suite, i.e., a set of test paths (possibly reduced to one test path), that is adequate for the All-States criterion. Justify your answer. Let's call this test suite TS_S.

Question 2 (5 marks): Create a test suite, i.e., a set of test paths (possibly reduced to one test path), that is adequate for the All-Transitions adequate criterion. Justify your answer. Let's call this test suite TS_T.

Question 3 (5 marks): Create a test suite, i.e., a set of test paths, that is adequate for the Transition-Tree criterion, following Chow's transition tree construction algorithm. Justify your answer. Let's call this test suite TS_{TT}.

Exercise 2 (15 pts)

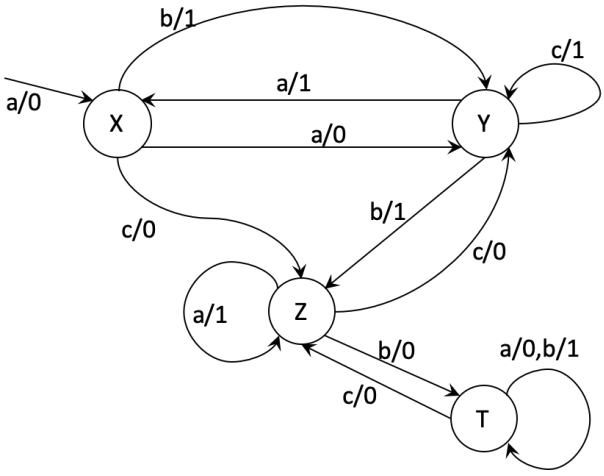
Consider the Finite State Machine below.
(The transition labeled "c/0, a/1" specifies that the transition is fired when either input c or input a is received and when it fires, output 0 is produced with input c and output 1 is produced with input a.)
Suppose this is the actual behavior that is implemented in the code for the specification of the Finite State Machine of Exercise 1.



Question 1 (5 marks): Does your test suite TS_S reveal the fault? Justify.
Question 2 (5 marks): Does your test suite TS_T reveal the fault? Justify.
Question 3 (5 marks): Does your test suite TS_{TT} reveal the fault? Justify.
Hint: in order to answer these questions, you must compare the sequence of outputs generated by your test paths as per the specification (FSM of exercise 1) to the sequence of outputs generated by your test paths on the implementation. You may want to use similar tables as in Exercise 1.

Exercise 3 (15 pts)

Consider the Finite State Machine on the right.
Suppose this is the actual behavior that is implemented in the code for the specification of the Finite State Machine of Exercise 1.
Answer the same questions 1, 2 and 3 as in Exercise 2.



Exercise 4 (5 pts)

Using the Finite State Machine of Exercise 1, confirm that {a}, {b}, and {b,a} are not characterization sequences, and that {a,b} is a characterization sequence. What is the expected output for each state with this characterization sequence?

Exercise 5 (15 pts)

If you append the characterization sequence of Exercise 4 to the test paths of TS_S, TS_T and TS_{TT}, do the answers to questions 1, 2 and 3 of Exercise 2 change?

Exercise 6 (15 pts)

If you append the characterization sequence of Exercise 4 to the test paths of TS_S, TS_T and TS_{TT}, do the answers to questions 1, 2 and 3 of Exercise 3 change?