CS628 Spring 2004 Quiz 2

Time: 60 mins | Total marks: 30

- ***The exam is open book and notes.***
- ***Results/proofs covered in class/problem sessions/assignments may simply be cited, unless specifically asked for.***
- ***Unnecessarily lengthy solutions will be penalized.***
- ***If you need to make any assumptions, state them clearly.***
- ***Do not copy solutions from others or indulge in unfair means.***

Consider the system shown in Fig. 1a, and the STG depicting its interaction with its environment shown in Fig. 1b.

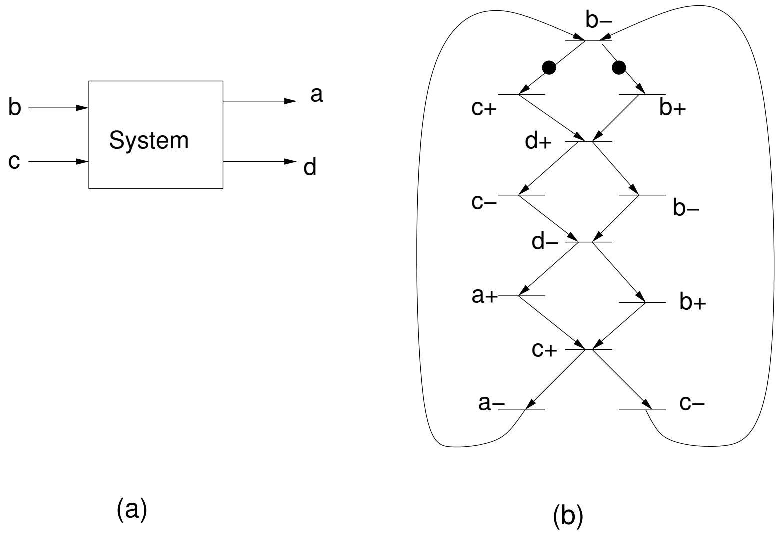

Figure 1: A system and its interaction with its environment

1. *[7 marks]* Draw the STD corresponding to the STG in Fig. 1b, and label all states with values of a, b, c, d *in that order.*

2. *[2.5 + 2.5 marks]* There are several pairs of states in this STD that violate CSC. Is there any pair of states that violates the USC property, but not the CSC property?

    - If your answer is in the affirmative, you must indicate the a, b, c, d label of the corresponding pair (that violates USC, but not CSC) and also give the next values of outputs a and d in each of these states.
    - If your answer is in the negative, you must pick any pair of states violating both CSC and USC, indicate the corresponding a, b, c, d label and also the next values of outputs a and d in each of these states.

3. *[8 marks]* We need to insert internal state variables in order to resolve the CSC conflicts. Is it possible to insert state variable changes without constraining the behaviour of the environment such that all CSC conflicts in this STD are resolved?

   - If your answer is in the affirmative, you must indicate in your STD where the changes in the state variable(s) must be inserted.
   - If your answer is in the negative, you must indicate why it is not possible to resolve all CSC conflicts without constraining the environment.

4. *[10 marks]* Suppose we know that input transitions on c, once enabled, take "unusually long" to fire. More specifically, the delay between the enabling of a transition on c and its actual firing is much larger than the delay between the enabling of a transition on any output or state variable of the system and its actual firing. We wish to exploit this to optimize the insertion of state variable changes in the STD for resolving CSC conflicts.

   Show where you would insert changes in a state variable in the STD of Question 1, such that all CSC conflicts are resolved. You must redraw the STD after insertion of this state variable change. You are allowed to use just one state variable.