CS226 Quiz 3 (Supplement) (Spring 2016)

April 15, 2016 **Time: 30 mins**

- *Be brief, complete and stick to what has been asked.*
- *Unless asked for explicitly, you may cite results/proofs covered in class without reproducing them.*
- *If you need to make any assumptions, state them clearly.*
- ***Please start writing your answer to each sub-question on a fresh page. DO NOT write answers to multiple sub-questions on the same page.***
- ***The use of internet enabled devices is strictly prohibited. You will be debarred from taking the examination if you are found accessing the internet during the examination.***
- ***Please do not engage in unfair or dishonest practices during the examination. Anybody found indulging in such practices will be referred to the D-ADAC.***

1. *[5 marks]* The circuit shown in Fig. 1 is also called a *C-element*. Assume that all 2-input AND , OR and NOR gates have delay 2, the EXOR gate has a delay 3 and every inverter has a delay of 1.

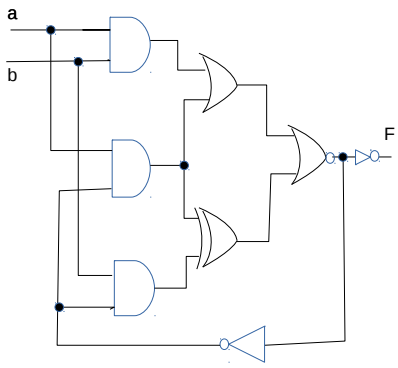

Figure 1: A C-element

The desired behaviour of the circuit is as follows:

- When both inputs a and b agree (i.e. both are 1 or both are 0), the output equals either input.
- When the two inputs a and b differ, the output of the circuit should be free of transitions (even transient changes or glitches are not allowed) and must stay at the last value of the output.

It turns out that the circuit may not function as desired if the inputs change too fast. Determine the smallest interval between two changes in the inputs (this could be from a change in one input to a change in the other, or to the next change in the same input) for the circuit to function as desired.