

Bioengineering 498A: Systems and Synthetic Biology

January 16, 2009

Homework Assignment #2

Due: 23th January 2009

Points awarded for each question are indicated in square brackets. Return assignment with your name clearly indicated at the top of your answer sheet. [Total points: 100]

[20] **Question 1.** Derive the following kinetic laws for a gene that are controlled by two transcription factors:

- a) OR gate
- b) NOR gate
- c) NAND gate

[55] **Question 2.** Using suitable software, built two simulation models of a Coherent Type I feed-forward network where the output gene is controlled by an OR gate in one network and an AND gate in the other network. In your simulation illustrate the properties of these networks. Investigate how the different parameters of your model affect the network dynamic properties. In the work you hand in, make sure you supply the simulation code that you used.

[25] **Question 2:** Build a simulation of a pulse generator using an Incoherent Type I Network. Provide output showing the network in operation and the simulation code.