Quiz 1
Systems Biology
Duration: 45 min, Total marks – 15
(course outcomes: CO-1, CO-2, CO-3)

1. What is the minimum pulse duration of X that is required to activate Z in the cascade:

$$X \text{-----}| Y \text{-----}| Z$$

What is the advantage of having a cascade instead of simple X----> Z?   [3 marks]

2. The regulator Y in coherent FFLs in transcription networks is often negatively autoregulated. How does this affect the dynamics of the circuit, if it has an AND input function at the Z promoter? How does this affect the delay times?   [3 marks]

3. Using the correct motif, derive the conditions for (a) first-in-first-out (FIFO) and (b) last-in-first out (LIFO).   [3 marks]

4. Use as the model the following equation: [6 marks]

$$\frac{dx}{dt} = \beta' + \beta.x - \alpha.x$$

Explain each term and solve for the response time. When might such a design is biologically useful. What will happen when $\beta > \alpha$?