Quiz 2
Systems thinking
Duration: 45 min, Total marks – 15
(course outcome: CO-4, 5)

1. A dynamic system is represented by the differential equation. **[2 marks]**

$$\tau \frac{dy(t)}{dt} + y(t) = r(t)$$

The system is given the sinusoidal input r(t) = sinωt. Calculate the output y(t).

2. Why can NAR speed up the response time compared to simple system? **[2 marks]**

3. Consider a cascade of three activators, X → Y → Z. What is its response time with respect to the time of activation of X? **[2 marks]**

4. Analyse the coherent FFL with OR logic at the Z promoter. What is the length of the delay following ON and OFF steps of Sx? Calculate it. **[2 marks]**

5. Two-output feedforward loop:
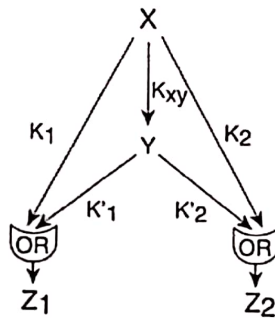


What is the condition for $Z_1$ to appear and disappear FIRST in comparison to $Z_2$ with increase and decrease in X, respectively? Explain your answer **[3 marks]**

6. What is the time and length scale in the blood glucose control? **[2 marks]**

7. What are the different ways by which biological signals control proteins? Explain the difference in the response time. **[2 marks]**