Quiz 2

Systems thinking

Duration: 30 min, Total marks – 10

1. Consider a second-order transfer function:

$$H(s) = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

How do you obtain the frequence response model and calculate the characteristic parameters? [**3 marks**]

2. Consider a filter with the following transfer function:

$$H(s) = \frac{10s}{1 + 10s}$$

Identify whether this is a **low-pass** or **high-pass** filter. Explain your answer [**2 marks**]

3. The dynamics of gene expression can be modeled by the following ordinary differential equation (ODE):

$$\frac{dX}{dt} = \beta - \frac{\alpha X}{K + X}$$

What kind of regulation is modeled? Calculate the steady state and response time [**3 marks**]

4. Discuss the process of gene expression from DNA to protein? [**2 marks**]