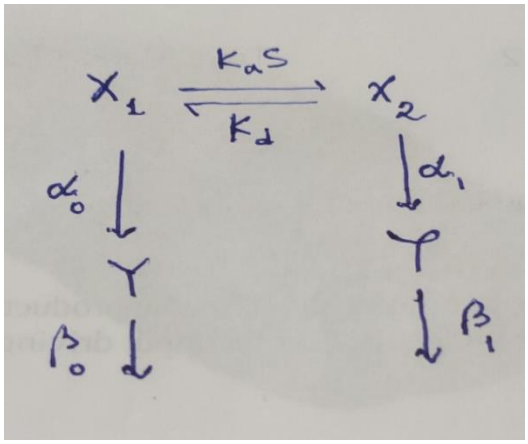
Exam

(Time 24 hours)

For the following reaction scheme



$X_1 + X_2 = X_T$

1. Write down the differential equation and calculate the steady state.

2. Write down the power spectrum of ΔX_1, ΔX_2 and ΔY.

3. Calculate the variance $\sigma^2 = \langle \Delta Y^2 \rangle$.

4. Write down the expression for fisher information.

$$\left\langle \frac{\partial}{\partial S}[log(Y:S)]^2 \right\rangle \simeq 1/\sigma^2 (\frac{\partial}{\partial S}\langle Y \rangle)^2$$

5. Write down the expression for entropy production rate.

6. Perform the Gillespie simulation with $k_a = 1$, $k_d = 1$, $\alpha_1 = 0.5$, $\alpha_0 = 0.05$, $\beta_1 = 0.05$, $\beta_0 = 0.01$

$X_1 + X_2 = X_T$, by vary S from 1 to 10.