QUIZ-I (MA3231/MA6012)

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1. Consider the two-species linear discrete model:

$$x_{n+1} = ax_n + by_n \tag{0.1}$$

$$y_{n+1} = cx_n + dy_n \tag{0.2}$$

where a, b, c, d are constants. Find the equilibrium points, check the stability of the same using Jacobian analysis. Discuss in detail.

2. Consider the two-species non-linear discrete model:

$$x_{n+1} = ax_n + bx_n y_n \tag{0.3}$$

$$y_{n+1} = cx_n y_n + dy_n \tag{0.4}$$

where a, b, c, d are constants. Find the equilibrium points, check the stability of the same using linear stability analysis. Discuss in detail.

3. Derive the SIR model for modeling spread of a disease spread with simple assumptions such as total population is constant, recovered individuals cannot get infected again, susceptibles can be infected only once. Discuss in details.