M.A./M.Sc. Examination 2018

Semester - III

Mathematics

Course: MMO-31 (A2) (New)

(Biomathematics-I)

Time: Three Hours **Full Marks: 40**

Questions are of equal value.
Attempt ***any four*** questions.

1. Write down the basic equations for a simple prey-predator model. Discuss the trajectories of the model including an account of degenerate trajectories.

2. Derive the time-delayed logistic equation for a single species non-age structured population and mention the possible biological mechanisms responsible for time-delay. Carry out the appropriate analysis to discuss the stability of the system for discrete time lag.

3. Develop a stochastic model by considering a linear birth-death-immigration-emigration processes in a single species non-age structured population. In the event of the absence of emigration, find the mean population size at any time t.

4. Develop a discrete time model to predict the future population of a single species with variable age distribution. Hence estimate the future human population growth having prior knowledge of the present age distribution.

5. Derive the stochastic epidemic model with carriers when a disease is spread only by carriers and they are eliminated by external action. Obtain the mean number of susceptibles and carriers at any time t.

6. Formulate a general deterministic epidemic model with the inclusion of loss of immunity in one case and immigration or emigration in another. Carry out an analysis for stability of equilibrium position in the environment of infected and removed individuals for the former case and of the susceptibles and infected for the later.

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