Roll No. .....

D–3295

B. A. (Part III) EXAMINATION, 2020

MATHEMATICS

(Optional)

Paper Third (E)

(Mathematical Modelling)

Time : Three Hours] [*Maximum Marks : 50*

Note : Attempt any *two* parts from each question. Each part carries equal marks.

Unit—I

1. (a) Discuss the relation of differential-difference equation models to other models.

   (b) Define Mathematical modelling with characteristics.

   (c) For the differential and delay-difference equation model given below, verify the given equilibrium positions and characteristic equations :

$$\frac{d\mathrm{N}}{dt} = b\,\mathrm{N}(t) - d\,\mathrm{N}(\mathrm{T})\,\mathrm{N}(t-1)$$

$$\bar{\mathrm{N}} = \frac{b}{d};\ \lambda + be^{-\lambda} = 0\,.$$

Unit—II

2. (a) Describe mathematical model for spread of technological innovations.

   (b) Discuss the possibility of the existence of stable age structure.

   (c) Write a note on use of Leslie matrix in structured population models.

Unit—III

3. (a) Explain the Lanchester's combat model.

   (b) Describe mathematical model for One-way Traffic problem.

   (c) Describe the mathematical model for diffusion of glucose in the blood stream.

Unit—IV

4. (a) Explain the Prey-Predator population models.

   (b) Compare deterministic and probabilistic Epidemic models.

   (c) Describe mathematical model for simple majority voting.

Unit—V

5. (a) Describe mathematical model for pollutant dispersion in wetland systems.

   (b) Obtain mathematical model for pure birth process.

   (c) Suppose that the population of a town was 2000 twenty years ago and that it increased continuously at a rate proportional to the existing population. If the population of the town is now 6000, find a formula relating population and time. What has been the rate of growth ?