

## GG345

### Dual Degree-B.Sc. (Hons.) Mathematics-M.Sc. Mathematics

### EXAMINATION, 2021

(Seventh Semester)

(B Scheme) (Re-appear)

B.Sc. (Hons.) M.Sc.(Mathematics)

MAT519H

MATHEMATICAL MODELLING

Time : 2½ Hours]

[Maximum Marks : 75

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Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

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**Note :** Attempt *Four* questions in all. All questions carry equal marks.

1. (a) If the temperature of air is 40°C and the substance cools from 110°C to 80°C in 20 minutes. Find when the temperature will be 50°C.  
(b) A bacterial population  $C$  is known to have a rate of growth  $\alpha$  to  $C$  itself. If between noon and 3 P.M. the population doubles, at what time, no controls being exerted, should  $C$  become 150 times. What it was at noon ?
2. (a) Write a brief note on simple compartment model.  
(b) What are main features of mathematical model ? Explain.
3. (a) Solve simultaneous equation :

$$t \frac{dx}{dt} + y = 0, \quad t \frac{dy}{dt} + x = 0, \quad \text{given } x(1) = 1 \text{ and } y(-1) = 0.$$

- (b) Solve Simple Epidemic Model.

4. (a) Explain domain first and second debt model.  
(b) Explain simple epidemic model with carriers and model with removal also.
5. Explain microbial growth of microbes in a chemostat.
6. (a) Explain the model of diabetes mellitus.  
(b) Discuss the complete disarmament case in Richardson's model for arms race.
7. Explain non-linear birth-death process of population growth.
8. Derive a stochastic model comprising linear Birth-death-Immigration and Emigration process.