

M.A./M.Sc. Examination 2019
Semester - IV
Mathematics
Optional Course: MMO-41(A02) (New Syllabus)
(Biomathematics-II)

Time: Three Hours

Full Marks: 40

Questions are of equal value.

Answer *any four* questions.

4×10=40

1. Derive the basic equations for the analysis of drug distribution in the n-compartment system. If there is a constant rate of infusion D till time T and it is stopped after time T , find the distribution of drug in the system at any time t .
 2. Develop a compartment model for diabetes mellitus, stating explicitly the assumptions you make therein. Analyse the model further and state some important observations from the solutions of the model.
 3. Analyse mathematically the flow of m -immiscible power law fluids in a rigid circular tube under a constant pressure gradient. Hence derive the Fahraeus-Lindquist effect.
 4. Define the creep compliance and the relaxation modulus of a viscoelastic material. Hence obtain them from a Kelvin model consisting of three Kelvin units connected in series. Also write down the relation between them in the Laplace transform space.
 5. Discuss Fick's first and second laws of diffusion. Carry out an analysis to solve one-dimensional diffusion equation subject to no flux conditions at both ends by separation of variables method. Hence show that the total amount of solute at any time t is equal to the initial amount.
 6. Mention the concept of dialysis of blood and state the function of hemodialyser. Develop a mathematical model of a circular duct hemodialyser with complete formulation of the diffusion-convection equation accompanied by necessary conditions. Make an attempt to solve the problem by separation of variables methods
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