

M.A./M.Sc. Examination 2017
Semester - IV
Mathematics
Optional Course: MMO-41 (A1)
(Biomathematics-II)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Notations and symbols have their usual meanings.

Answer any four questions.

1. Formulate a compartmental model for diabetes mellitus, stating explicitly the assumptions you make therein. Solve the model equations and state the salient features that one can make out of the analysis. 5+5

 2. a) What is meant by creep and stress relaxation of viscoelastic material? 4
b) Obtain the constitutive equation when a spring and a Kelvin element are in series. Show that it qualifies as a solid. 2+4

 3. a) Obtain the differential equation when an arbitrary number of Maxwell units are connected in series, possible including the degenerated units. 5
b) Prove that $\bar{J}(S)\bar{Y}(S) = \bar{S}^2$. 5

 4. a) Obtain the expressions for velocity and flux for one-dimensional steady flow of Power law fluid past a rigid circular tube. Hence obtain the corresponding expressions for Newtonian fluid. 4+1
b) Define yield stress. Obtain the expression of plug velocity for Casson fluid under constant pressure gradient in unidirectional flow. 1+4

 5. a) Discuss the pulsatile flow of Newtonian fluid in a rigid tube. 5
b) Explain Fahraeus-Lindqvist effect. 5

 6. a) Discuss two major hypotheses on brain damage. 5
b) Formulate a mathematical model for study of the physiological problem of brain injury, when the head is subjected to impulsive load. 5
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