

T.E Sem-VI (R) **Biomedical  
Biological Modeling and  
Simulation**

Con. 5748-10.

GT-7599

(3 Hours) 29-12-10

[ Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.  
(2) Attempt any four questions out of remaining six questions.  
(3) Figures to the right indicate full marks.

1. (a) Explain the need of validity criteria in the formation of model. 5  
(b) Write expression for Goldman's equation and explain its significance. 5  
(c) Write expression for cable expression and explain its significance. 5  
(d) Define model. List all the steps of Modeling. 5
2. (a) Draw linearized model of immune response and explain its significance. 5  
(b) Explain Hodgekin-Huxley conductance equation in short. 5  
(c) Draw equivalent model for cardiovascular system and explain it short. 5  
(d) Define and explain pharmacokinetics for drug delivery system. 5
3. (a) Explain biophysics tools with help of laws and related derivation. 5  
(b) Explain active transport mechanism with neat diagram. 5  
(c) Explain and derive Nernst equation and give its significance. 5  
(d) Draw electrical equivalent model of a biological membrane and explain it in short. 5
4. For Neuromuscular system answer the following :— 20  
(a) Draw and explain the concept of stretch reflex in detail.  
(b) Differentiate one control and two control mechanism.  
(c) Draw and explain reciprocal innervation model in detail.  
(d) What is the role of Golgi tendon organ in modeling of neuromuscular system ?
5. For thermoregulatory system explain the following :— 20  
(a) Draw block diagram of thermoregulatory system and explain it in short.  
(b) Explain validation of model for thermoregulatory system in detail.  
(c) What is the significance of controller model ? Explain it with the help of graphical method.  
(d) Mention any three industrial applications of thermoregulatory system and explain any one in detail.
6. (a) Explain four types of eye movements in detail with example of each. 5  
(b) Draw model of thermoregulatory plant and explain it in short. 5  
(c) Explain the significance of quantitative eye movement model in detail. 5  
(d) Explain the concept of respiratory model with proper diagram. 5
7. Write short notes on (any four) :— 20  
(a) Voltage clamp mechanism.  
(b) Insulin glucose feedback system.  
(c) Parkinson's Syndrome.  
(d) Compartmental modeling.  
(e) Donnan equilibrium equation and its significance.