

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V EXAMINATION – WINTER 2015

Subject Code: 150304**Date: 14/12/2015****Subject Name: Modelling & Simulation of Biological Systems****Time: 10:30am to 1:00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What is Human Physiology? Classify types of physiological control with necessary examples. **07**
- (b) Derive the similarity of physiological and engineering control systems with examples. **07**
- Q.2** (a) Derive heart as an electrical analogy with appropriate equations. **07**
- (b) Enlist and explain the limitations of westheimer's eye movement model. Using which model, we can overcome the limitations? **07**
- OR**
- (b) How many muscle pairs are useful for saccadic eye movement? Explain the oculomotor muscle model in detail. **07**
- Q.3** (a) Define steady state. Explain the steady state analysis of gas exchange model. **07**
- (b) Give merits of lumped and distributed parameter model. **07**
- OR**
- Q.3** (a) Explain the morphology of linear lung mechanics model. **07**
- (b) State principal of super position. Justify it using any 2 examples of physiological systems. **07**
- Q.4** (a) Describe muscle stretch reflex model with necessary equations. **07**
- (b) Explain the blood circulatory model with appropriate equations. **07**
- OR**
- Q.4** (a) State and explain the methods of transient response analysis. What are the characteristics of transient response of a second order system? **07**
- (b) Explain the cardiac cycle and physiology of circulatory systems. **07**
- Q.5** (a) Draw and explain the SIMULINK model of heart rate controller for varying respiration rate. **07**
- (b) What is viscoelasticity? Explain viscoelasticity and its' behavioral aspects of lung tissue. **07**
- OR**
- Q.5** (a) Enlist the glucose reduction channels. Explain the control of glucose by change in insulin production rate. **07**
- (b) Draw and explain the SIMULINK model of simple lung mechanics. Justify the results of model. **07**
