

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 150304****Date: 09-12-2013****Subject Name: Modeling and Simulation of Biological Systems****Time: 10:30 pm to 01:00 pm****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) Describe the chemical regulation of ventilation with neat diagrams. **07**
(b) Draw and explain the curves of Cardiac Output and Venous Return for below **07**
given conditions.

1. Normal
2. Moderate Exercise
3. Heart Failure

- Q.2** (a) Draw the simplified model of cardiac output regulation. **07**
(b) Briefly explain Distributed Parameter Versus Lumped Parameter. **07**

OR

- (b) Explain robinson's model with agonist and antagonist neurological control **07**
signal.

- Q.3** (a) Draw and explain the plots of saccade characteristics with necessary **07**
mathematical expressions.
(b) What do you mean by steady-state operating point? Give an appropriate **07**
example.

OR

- Q.3** (a) Draw and explain westheimer's saccadic eye movement model. **07**
(b) Draw and explain the linear model of muscle mechanics. **07**

- Q.4** (a) Draw and explain the frequency response charts of glucose-insulin model and **07**
discuss about its stability.
(b) What do you mean by nonlinearity in model? Explain the concept with **07**
appropriate example.

OR

- Q.4** (a) Draw and conclude the results of lung mechanics model for varying ventilator **07**
frequency.

- Q.4** (b) Explain the difference between Engineering and Physiological Control System **07**
with necessary examples.

- Q.5** (a) Derive the equations which govern the model of heart and systemic circulations. **07**
(b) Draw the SIMULINK model of blood glucose-insulin model. **07**

OR

- Q.5** (a) Draw SIMULINK model of neuromuscular reflex model. **07**
(b) Describe open-loop and closed-loop transient responses for first order model. **07**
