GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V • EXAMINATION – SUMMER 2013

| Subject Code: 150304Date: 23-05-2013Subject Name: Modeling & Simulation of Biological SystemsTime: 10:30 pm to 01:00 pmInstructions: | | | |
|--|----------------|--|----------|
| | 1. 2. 3. | Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks. | |
| Q.1 | (a) | Give the difference between Open loop verses close loop system with appropriate example. | 07 |
| | (b) | Discuss the characteristics of mathematical model & conceptual model. | 07 |
| Q.2 | (a) (b) | Draw and explain the saccade characteristics of eye movement. Write a short on the model given by Robinson. | 07 07 |
| | (b) | Draw and explain the saccadic eye movement model given by Westheimer. | 07 |
| Q.3 | (a) | What is glucose-insulin balance? Explain the schematic model for regulation of glucose & insulin. | 07 |
| | (b) | Explain the relationship between heart rate & arterial blood pressure with the SIMULINK model. | 07 |
| | | OR | |
| Q.3 | (a) | Briefly explain the frequency response of glucose-insulin model with appropriate graphs. | 07 |
| | (b) | What is the respiratory controller? Explain the chemical regulation of ventilation. | 07 |
| Q.4 | (a) | Calculate the equilibrium point for muscle stretch reflex model with nonlinear characteristics. | 07 |
| | (b) | Draw and explain the cardiac output curves with below mentioned functionality. A. Factors affecting slope and position B. Factors affecting only position OR | 07 |
| Q.4 | (a) | State the starling's law. Draw and explain the simplified model of cardiac output regulation. | 07 |
| Q.4 | (b) | Draw and explain the venous return curves with below mentioned functionality.A. Factors affecting slopeB. Factors affecting position | 07 |

Q.5 (a) Suggest and justify a system analysis technique for a close-loop system with 04 below given frequency response.



- (b) Draw and explain steady-state closed-loop analysis of cardiac output regulation 10 during
 - A. Normal resting conditions
 - B. Moderate exercise and
 - C. Compensated heart failure

OR

- Q.5 (a) What do you mean by parameter estimation? Draw a parametric model of any 04 system.
 - (b) The electrical analogy of lung mechanics model is given in figure. Draw an 10 equivalent mechanical analogy for lung mechanics model and find the transfer function of the model.


