

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 150304****Date: 23-05-2013****Subject Name: Modeling & 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) Give the difference between Open loop versus close loop system with appropriate example. **07**

(b) Discuss the characteristics of mathematical model & conceptual model. **07**

Q.2 (a) Draw and explain the saccade characteristics of eye movement. **07**

(b) Write a short on the model given by Robinson. **07**

OR

(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. **07**

A. Factors affecting slope and position

B. Factors affecting only position

OR

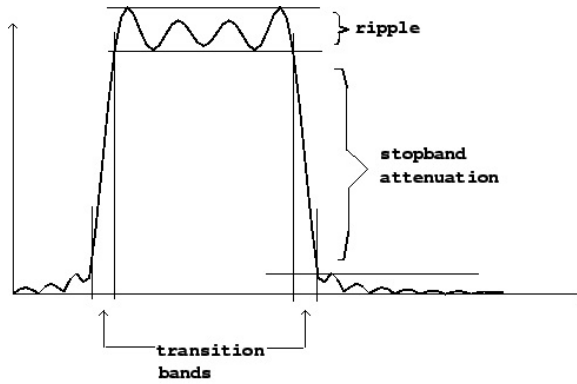
Q.4 (a) State the Starling's law. Draw and explain the simplified model of cardiac output regulation. **07**

Q.4 (b) Draw and explain the venous return curves with below mentioned functionality. **07**

A. Factors affecting slope

B. Factors affecting position

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



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

OR

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

