Seat No.: _____ Enrolment No._____

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 given conditions. 1. Normal 2. Moderate Exercise 3. Heart Failure	**07**
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 signal.	**07**
Q.3	**(a)**	Draw and explain the plots of saccade characteristics with necessary mathematical expressions.	**07**
	(b)	What do you mean by steady-state operating point? Give an appropriate example.	**07**
		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 discuss about its stability.	**07**
	(b)	What do you mean by nonlinearity in model? Explain the concept with appropriate example.	**07**
		OR	
Q.4	**(a)**	Draw and conclude the results of lung mechanics model for varying ventilator frequency.	**07**
Q.4	**(b)**	Explain the difference between Engineering and Physiological Control System with necessary examples.	**07**
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**

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