GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VII • EXAMINATION – SUMMER • 2015

Subject code: 170302Date: 08/0Subject Name: Physiological System ModelingTotal MailTime: 02.30pm-05.00pmTotal MailInstructions:Total Mail			05/2015 arks: 70	
Q.1	(a) (b)	What is physiological system? Explain Muscles stretch reflex model using suitable block diagram. Justify that "Physiological control systems are more difficult to model than engineering control."	07 07	
Q.2	(a) (b)	 Enlist and explain the different generalized properties of system, which will help to model the physiological system. Write a short note on Distributed parameter and lumped parameter Closed loop system and open loop system 	07 07	
	(b)	Explain a basic eye movement system and wetheimer's saccade eye model	07	
Q.3	(a) (b)	Distinguished between physiological control system and Engineering control system. Explain the linear model of respiratory mechanics and muscles mechanics	04 10	
Q.3	(a) (b)	OR Explain the chemoreflex regulation of respiration in detail. Explain first order dynamics of the linearized respiratory mechanics model and also derive the step and impulse response for the first order system.	07 07	
Q.4	(a) (b)	Explain the model of cardiac output regulation. What is diabetes? Explain the regulation of glucose and insulin for both type-1 and type 2 diabetes using suitable model.	07 07	
Q.4	(a) (b)	Draw and explain the different sub model used to build a model of neuromuscular reflex motion. What is Root-locus? Explain all the rules that required to find the loci of any system when value of K is changed from 0 to ∞ .	07 07	
Q.5	(a) (b)	Draw and explain the frequency response of a model of circulatory control. What do you understand by stability? Explain the Routh-Harwitz stability criteria in detail. Find out the stability of given characteristics equation $s^3 + 6s^2 + 11s + 6 = 0$	07 07	
Q.5	(a)	OR Explain parametric and nonparametric system identification method.	07	
	(b)	Explain any one in detail. Figure 1, shows the block diagram of a sophisticated biomedical device for regulating the dosage of anesthetic gases delivered to a patient during surgery. Note that the plant and controller are themselves feedback control	07	



Figure 1. Block diagram of the control system of a hypothetical biomedical device.

- 1. Derive an expression for the closed-loop gain of the overall control system
- 2. Derive an expression for the open-loop gain of the overall control system
- 3. If $G_1 = 1$, $G_2 = 2$, $H_1 = 1$, and $H_2 = 2$, what is the loop-gain of the overall system.
