Seat No.: _____ Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (OLD) • EXAMINATION – WINTER 2017

Subject Code:150304 **Date: 30-11-2017**

Subject Name: Modelling & Simulation of Biological systems

Time: 10:30 am to 01:00 pm **Total Marks: 70**

Instructions:

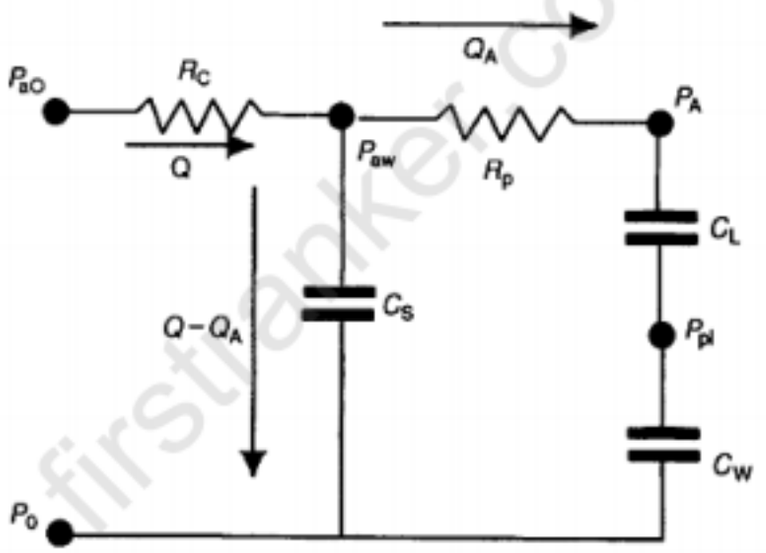
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Give differences between engineering control system and physiological control system. **07**

(b) Give difference between open loop and closed loop control system. Give two examples of each. **07**

Q.2 **(a)** Draw and explain linear model of muscle mechanics, derive the equation of force for steady state isometric condition. **07**

(b) Develop the mechanical equivalent of the electrical analog of respiratory mechanics shown in below given figure. **07**



OR

(b) Draw and explain the linear model of respiratory mechanics. Derive the equation for Pao and Q. **07**

Q.3 **(a)** Draw & explain time response and frequency response of glucose-insulin model for normal and type-2 diabetic patient. **07**

(b) Describe cardiac output regulation with help of model and cardiac output curves **07**

OR

Q.3 **(a)** With neat figure describe linearized dynamic model of chemo reflex control of ventilation **07**

(b) Explain with neat diagram wetheimer's saccade eye model. **07**

Q.4 **(a)** Explain adaptive characteristics of muscle stretch reflex **07**

(b) Explain superposition theorem and show how it is used to identify whether the system is linear or nonlinear. **07**

OR

Q.4 **(a)** Explain occulumotor eye muscle model with neat diagram. **07**

(b) Explain difference between time domain and frequency domain approach. **07**

Q.5	**(a)**	Explain distributed and lumped parameter with examples. Derive the equation for intracellular voltage along the nerve fiber.	**07**
	(b)	Draw simulink model of muscle stretch reflex.	**07**

OR

Q.5	**(a)**	With help of neat diagram explain cardiopulmonary model.	**07**
	(b)	Explain with diagram that pupilliary light reflex is classic example of positive or negative feedback control systems.	**07**

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