

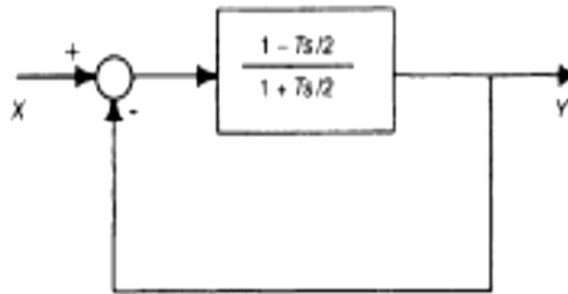
GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2019****Subject Code: 2150305****Date: 31/05/2019****Subject Name: Modelling & Simulation of Physiological systems****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

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

		MARKS
Q.1	(a) Explain with equations concept of Resistance, Capacitance and Inductance in terms various physical qualities so that they can be used in development of “gray-box” models.	03
	(b) Explain with neat block diagram adaptive characteristics of muscle stretch reflex.	04
	(c) Explain with diagram and equations linear model of respiratory mechanics. Draw Simulink model for the same.	07
Q.2	(a) Draw mechanical equivalent of electrical analog of simple respiratory mechanics model.	03
	(b) Develop an electrical analog of simple muscle mechanics model.	04
	(c) Using simple model of cardiac output regulation as per Starling's law explain with graph cardiac output curves.	07
	OR	
	(c) Explain venous return curve for simple heart model. Which effects will increase mean systematic pressure (Pms)?	07
Q.3	(a) Explain model of steady state CO ₂ exchange in lungs.	03
	(b) Explain with equation and neat diagram open loop and closed loop transient responses of second order model for impulse responses.	04
	(c) Explain with neat schematic regulation of glucose and insulin in human body.	07
	OR	
Q.3	(a) Explain model of steady state O ₂ exchange in lungs.	03
	(b) Explain with equation and neat diagram open loop and closed loop transient responses of second order model for step responses.	04
	(c) With help of neat schematic and equation develop a model for Neuromuscular reflex action. Draw graph to support your model.	07
Q.4	(a) Write difference between engineering and physiological systems.	03
	(b) Explain Cheyne- stokes breathing model.	04
	(c) Explain with neat diagram oculomotor muscle model.	07
	OR	
Q.4	(a) Difference between open loop and closed loop systems.	03
	(b) Explain stability analysis of pupillary light reflex.	04
	(c) Explain linear reciprocal innervations oculomotor model.	07
Q.5	(a) Explain various types of eye movements.	03
	(b) Explain open loop frequency response for linearized respiratory mechanics model.	04
	(c) Explain Hodgkin and Huxley's model with neat diagram.	07

OR

- Q.5 (a) Explain difference between lumped and distributed parameter models. 03
- (b) Explain closed loop frequency response for linearized respiratory mechanics model. 04
- (c) The following transfer function is one of the simplest linear approximation to the pure time delay, T: 07
 $H(s) = \frac{1 - Ts/2}{1 + Ts/2}$
 Determine the open loop and closed loop responses for the system shown below when the input is a unit step.



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