

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2020

Subject Code:2150305

Date:03/02/2021

Subject Name:Modelling & Simulation of Physiological systems

Time:10:30 AM TO 12:30 PM

Total Marks: 56

Instructions:

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) Explain the system properties with an example.	03
	(b) Explain the needs of physiological modeling.	04
	(c) “A true static equilibrium never really exists for physiological systems” Justify the statement with appropriate examples.	07
Q.2	(a) Give Classification of model.	03
	(b) Explain different system properties that can be characterized using Mathematical expression.	04
	(c) Difference between engineering and physiological control system?	07
Q.3	(a) Explain the determination of steady state operating point.	03
	(b) Explain relationship between transient and frequency response.	04
	(c) Draw and explain SIMULINK model of Glucose-insulin regulation.	07
Q.4	(a) Describe the saccade characteristics.	03
	(b) Explain venous return curve and discuss its effect on Systemic Pressure.	04
	(c) Draw and explain model of Chemical regulation of Ventilation.	07
Q.5	(a) Draw and explain the SIMULINK model of simple lung mechanics.	03
	(b) Give advantages and disadvantages of SIMULINK.	04
	(c) Plot the responses of the second-order lung mechanics model to a unit impulse under open-loop and closed-loop modes.	07
Q.6	(a) Draw and explain Oculomotor muscle model	03
	(b) Explain robinson’s model with agonist & antagonist neurological control signal.	04
	(c) Explain Stability Analysis of the Pupillary Light Reflex.	07
Q.7	(a) Explain viscoelasticity in terms of lung tissue.	03
	(b) Draw and briefly explain Hodgkin and Huxley’s SIMULINK model.	04
	(c) Derive all the equations showing the dynamics of the neuromuscular reflex motion with suitable diagrams.	07
Q.8	(a) Discuss Cardiac Output curves.	03
	(b) Explain Nyquist Stability criterion with example.	04
	(c) Explain Frequency Response of a Model of Circulatory Control.	07
