Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subject Code: 2150305 **Date:05/12/ 2015**

Subject Name: Modeling & Simulation of Physiological System

Time:10:30am to 1:00pm **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 applications of Lumped and Distributed parameter model with necessary examples.	**07**
	(b)	Give classification of model. Explain types of model with examples.	**07**
Q.2	**(a)**	Derive mathematical formulas of linear model of muscle mechanics.	**07**
	(b)	"A true static equilibrium never really exists for physiological systems" Justify the statement with appropriate examples.	**07**
		OR	
	(b)	"The negative feedback in physiological control system is embedded within the characteristics of the system." Justify the statement with appropriate examples.	**07**
Q.3	**(a)**	Explain the characteristics of system elements that can be used for modelling.	**07**
	(b)	Draw and explain the cardiac output and venous return curves.	**07**
		OR	
Q.3	**(a)**	Draw and explain the graphs of linear muscle mechanics model.	**07**
	(b)	Define mean circulatory pressure. Derive mathematical representation of venous return using mean circulatory pressure.	**07**
Q.4	**(a)**	Draw and explain the Westheimer's saccadic eye movement model. Derive the mathematical formulas of time to Peak Overshoot and maximum velocity.	**07**
	(b)	Explain the mathematical model for control of glucose-insulin for subjects having normal and abnormal conditions.	**07**
		OR	
Q.4	**(a)**	Enlist the outcomes and limitations of Westheimer's saccadic eye movement model. Which limitations can be resolved using Robinson's model? How?	**07**
	(b)	Describe the frequency response of glucose-insulin model for normal and abnormal subjects with necessary graphs.	**07**
Q.5	**(a)**	Draw and explain SIMULINK model for cardiovascular variability due to breathing pattern.	**07**
	(b)	Discuss the results of Hodgkin and Huxley's SIMULINK model. Does this model display the properties of thresholding and refractoriness?	**07**
		OR	
Q.5	**(a)**	Draw and explain SIMULINK model for Beat-to-beat fluctuations in the duration of the cardiac cycle, arterial blood pressure, and cardiac output with multiple feedback loop.	**07**
	(b)	Draw the strength-duration curve for a neuron. What part does the electrical resistance of membrane performs?	**07**

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