

GANPAT UNIVERSITY
B.TECH SEM. V. BIOMEDICAL & INSTRUMENTATION ENGINEERING
REGULAR EXAMINATION NOVEMBER/DECEMBER-2011
BME-502: BIOLOGICAL CONTROL SYSTEMS AND MODELING

TIME: - 3 HOURS

TOTAL MARKS: - 70

INSTRUCTION: - 1 Write the answer of each section in separate answer sheet.

2 Figure to the right indicates full marks.

3 Assume suitable data if necessary.

SECTION-I

Que-1

12

- (a) Draw the series and parallel combination of resistance, capacitance, dashpots and spring components for electrical and mechanical system respectively. Also derive its mathematical expression.
- (b) Draw and explain the linear model of skeletal muscle. Also derive the TF of the same model.

OR

Que-1

12

- (a) Why the reflex action is so fast? Explain the muscle stretch reflex with schematic and block diagram.
- (b) Draw and explain the linear model of respiratory mechanics muscle. Also derive the TF of the same model.

Que-2

11

- (a) What is steady state operating point? With block diagram explain the steady state characteristic of muscle stretch reflex model.
- (b) Explain and derive the equation of gas exchange process in lungs in terms of partial pressure of O_2 and CO_2 in blood.

OR

Que-2

11

- (a) Explain the venous return curve for regulation of cardiac output.
- (b) What do you mean by regulation of glucose? With diagram explain the three major way through which glucose is regulate in body.

Que-3

12

- (a) Explain the linear system and superposition principle.
- (b) What is control system? With example explain the open loop and closed loop control system.

SECTION-II

Que-4

12

- (a) Define mathematical modeling. How modeling can be helpful to generate the new theories? Give at least 2 examples.
- (b) Describe and draw mechanical model of respiratory mechanics.

OR

Que-4

12

- (a) How much blood is ejected during each ventricular stroke? How cardiac output is calculated?
- (b) Draw and explain the cardiovascular model.

Que-5

11

- (a) What are the factors affecting the integration of cardio pulmonary dynamic modeling.
- (b) Develop model for pulmonary mechanics and its equivalent electric analogy.

OR

Que-5

11

- (a) Enlist and explain equations describing relationship between pressure volume and flow in circulatory system.
- (b) Draw the pressure curve related to each portion of the cardiac circulation. Mention the path for systemic and pulmonary circulation

Que-6

12

- (a) What is viscoelastance? Draw and explain P-V curve for normal lung condition.
- (b) Describe the model that characterize airways, chest wall in addition to lungs tissue and describe the differential equation.

END OF PAPER