Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM- V (BM&I) REGULAR EXAMINATION– NOV-DEC 2016

2BM501 Physiological Control Systems & Modeling

TIME: 3 HRS **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 **(10)**

a) What is the difference between afferent neural frequency and efferent neural frequency? **(2)**

b) Comment on a linearity of engineering control system and physiological control system. **(3)**

c) Define dead space ventilation? Draw the steady state model of the chemical regulation of ventilation, CO2 and O2 exchange in the lung and explain in detail. **(5)**

OR

Q.1 **(10)**

a) Draw the block diagram displaying the steady state characteristics of muscle stretch reflex model components. Explain in detail. **(5)**

b) Define type 1 and type 2 diabetes? Draw the SIMULINK model for the glucose regulation model and Explain in detail. **(5)**

Q.2 **(10)**

a) What is the influence of input fluctuations on control of any system using open loop and closed loop schemes? Explain by using appropriate example. **(5)**

b) What is regulation of cardiac output? Draw the functional block diagram and simplified model for cardiac output regulation. Explain. **(5)**

OR

Q.2 **(10)**

a) Draw the model of neuromuscular reflex motion and explain in detail. **(5)**

b) What is venous return curve? Explain in detail. **(5)**

Q.3 **(10)**

a) Answer in short: **(5)**

i) Which signal / waveform are used as an input in glucose regulation model?

ii) What is the role of higher center in adaptive model of physiological control system?

iii) Define "Mean Circulatory Pressure".

iv) Which signal / waveform are used as an input in chemical regulation model?

v) What is pleural pressure in cardiac output regulation model?

b) What is extensive degree of cross coupling among different physiological control system? Draw and explain by using example. **(5)**

SECTION: II

Q.4 (10)

a) What do you mean by reflex? Draw the schematic illustration of muscle stretch reflex and explain it (5)

b) Derive the Transfer Function of Linear model of respiratory mechanics. (5)

OR

Q.4 (10)

a) Give the important features of muscle stretch reflex example. Draw block diagram representation of muscle stretch reflex and explain it. (5)

b) For first order linear lumped model of lung mechanics derive the impulse and step response. (5)

Q.5 (10)

a) Which are the major ways through which glucose is eliminated from the blood? Explain. (4)

b) Draw the functional block diagram of adaptive characteristics of muscle stretch reflex action and explain in detail. (4)

c) Enlist the examples of positive feedback and negative feedback mechanism of physiological control system? (2)

OR

Q.5 (10)

a) Draw the model represents frequency response of glucose insulin regulation. Write the procedure for drawing the model. Also represents the different types of diabetes condition. (6)

b) What is the effect of chest wall compliance on flow rate and volume in respiratory mechanism? Explain. (4)

Q.6 (10)

a) What do mean by gray-box model or parametric model? Draw and explain storage property in different system. (5)

b) For linear lumped model of lung mechanics derive the TF for open loop and closed loop configuration. (5)

----------END OF PAPER----------