

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (OLD) - EXAMINATION – SUMMER 2017****Subject Code: 170302****Date: 02/05/2017****Subject Name: Physiological System Modelling****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.

- Q.1** (a) Determine the response in angular displacement of the eye in Fig. 1 If the targeted input  $\theta_{ref}$  were to follow the trajectory of a unit ramp i.e.,  $\theta_{ref} = t$  ( $t > 0$ ). How would this ramp response be affected if the velocity feedback gain,  $k_v$ , were made negative? **07**
- (b) The following transfer function is one of the simplest linear approximation to the pure time delay,  $T$ : **07**

$$H(s) = [1 - Ts/2] / [1 + Ts/2]$$

Determine the open-loop and closed -loop responses for the system shown in fig. 2 when the input is a unit step.

- Q.2** (a) With neat diagram explain CO<sub>2</sub> exchange in lungs. **07**
- (b) Explain steady state analysis of glucose regulation under normal condition, Type-1 diabetes and Type-2 diabetes with schematic of process. **07**

**OR**

- (b) With neat figure describe linearized dynamic model of chemo reflex control of ventilation **07**
- Q.3** (a) Explain difference between Engineering control system and Physiological control system. **07**
- (b) With help of principle of superposition explain how we can determine whether the system is linear or non linear. **07**

**OR**

- Q.3** (a) Explain cardiac output regulation with help of model and cardiac output curves. **07**
- (b) In venous return curve explain which factors effect slope and which affect position, how? **07**

- Q.4** (a) Explain frequency response of glucose- insulin regulation. **07**
- (b) With neat diagram explain linearized model of skeletal muscles. **07**

**OR**

- Q.4** (a) With help of functional scheme of pupillary control system describe linearized model of pupillary light reflex. Derive necessary equations. **07**
- (b) Explain dynamics of neuromuscular reflex motion with its simulink model. **07**

- Q.5** (a) Draw and explain simulink model of muscle stretch reflex. **07**
- (b) Explain model of simple lung mechanics. **07**

**OR**

- Q.5** (a) Explain Kao's cross-circulation experiments. **07**
- (b) Explain shortly Non parametric and Parametric identification methods. **07**

\*\*\*\*\*