

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-IV • EXAMINATION – WINTER 2013

Subject Code: X41102**Date: 05-12-2013****Subject Name: Control Theory****Time: 02.30 pm - 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) Explain the components of Control System with neat sketch **07**
 (b) Discuss classification of control system **07**
- Q.2** (a) What is Transfer System? Explain the procedure for determining the transfer function of a control system **07**
 (b) Derive transfer function of Kirchhoff's voltage and current law. **07**
- OR**
- (b) Derive the transfer function of mercury in a simple glass thermometer and draw its electrical analogous circuit. **07**
- Q.3** (a) Explain the effect of feedback on transient response **07**
 (b) Obtain the transfer function of the system shown by block diagram reduction technique and also using signal flow graph of the following Figure 1. **07**

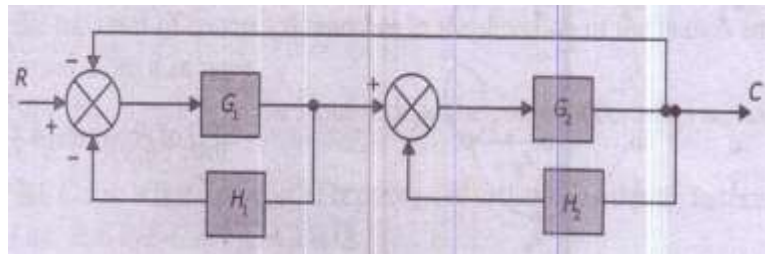


Figure 1

OR

- Q.3** (a) Explain the effect of feedback on Disturbance signal. **07**
 (b) Find the gain of the control system represented in block diagram form as in figure 2 using Mason's gain formula. **07**

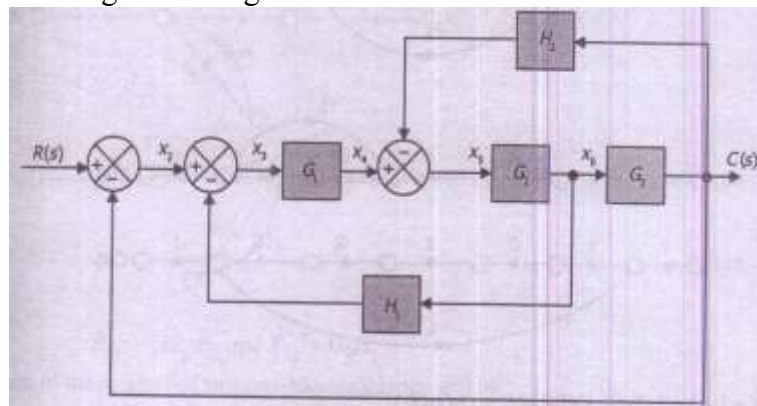


Figure 2

- Q.4** (a) A thermal system having input water temperature Θ_i and output water **07**

temperature Θ_o is given; write transfer function of the system.

- (b) Explain linearization of non linear mathematical models. **07**

OR

- Q.4** (a) Write a transfer function of simple liquid level pressure difference system. **07**

- Q.4** (b) Tabulate the analogous quantities of mechanical and electrical systems using (a) force voltage analogy and (b) force current analogy. **07**

- Q.5** (a) Explain root locus construction rules. **07**

- (b) Consider the characteristic equation of a system: **07**

$$s^4 + s^3 + 2s^2 + 2s + 3 = 0,$$

What is the status of the stability of the systems?

OR

- Q.5** (a) A transfer function of a unity feedback system is **07**

$$G(s) = K/(s(s+5)).$$

Draw the root locus plot and determine the value of K for a damping ratio of 0.707.

- (b) Consider the characteristic equation of a system: **07**

$$S^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$$

Find the status of its stability.
