

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-IV • EXAMINATION – SUMMER • 2014

Subject Code: X41102

Date: 19-06-2014

Subject Name: Control Theory

Time: 10:30 am - 01:00 pm

Total Marks: 70

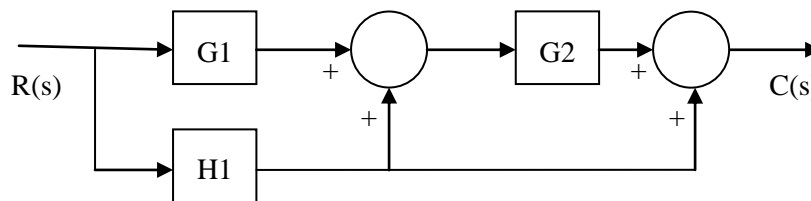
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Compare open loop and closed loop control systems with suitable examples. **07**
 (b) Select a control system of your choice and draw its block diagram. The block diagram must contain minimum two loops. **07**
- Q.2** (a) Briefly explain how a transfer function can be obtained from state space representation and vice versa using MATLAB commands. **07**
 (b) Obtain the state space model for the R-L-C series circuit connected to a DC supply. You can choose inductor current and capacitor voltage as state variables. **07**

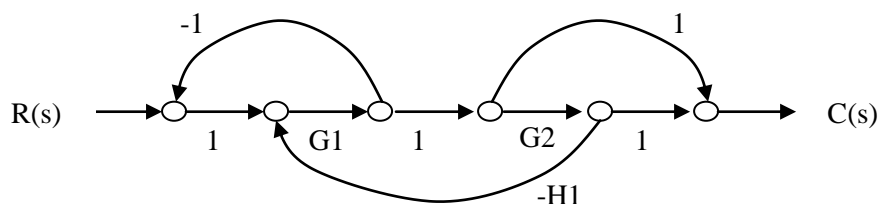
OR

- (b) Write the equation for a R-L series circuit connected to a DC supply. Obtain the transfer function between inductor current and supply voltage. **07**
- Q.3** (a) Define the terms (1) Maximum overshoot (2) Rise time (3) Damping ratio in terms of time response of a system. **07**
 (b) Obtain the transfer function $C(s)/R(s)$ using block diagram reduction technique for the following system. **07**



OR

- Q.3** (a) Discuss the time response of a first order system with unit step input **07**
 (b) Obtain the transfer function $C(s)/R(s)$ using Mason's gain formula for the signal flow graph shown in the following figure. **07**



- Q.4** (a) With suitable example explain the Bode plots. **07**
 (b) Define Gain margin, Phase margin, Gain cross over frequency, Phase **07**

cross over frequency.

OR

- Q.4** (a) Briefly explain Polar plots for Type 0 and Type 1 systems. **07**
(b) Write a short note on controllability. **07**

- Q.5** (a) Draw the Root locus for a system with open loop transfer function **07**
 $G(s)H(s) = 50 / (s(s+1)(s+2))$
(b) Gain of a block is $G(s) = 2 / (s+2)$ and that of the other is $H(s) =$ **07**
 $1/(s^2+4s+4)$. Find the overall transfer function if these two blocks are
connected in (1) Cascade and (2) Parallel.

OR

- Q.5** (a) The open loop transfer function of a unity feedback control system is **07**
 $G(s) = K / (s+1)(s+5)$. Determine the range of 'K' for which the
system is stable using Routh Herwitz criteria.
(b) Discuss Absolute stability, Relative stability and Conditional stability of **07**
a control system.
