

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 161905

Date: 07/01/2013

Subject Name: Control Engineering

Time: 02.30 pm - 05.00 pm

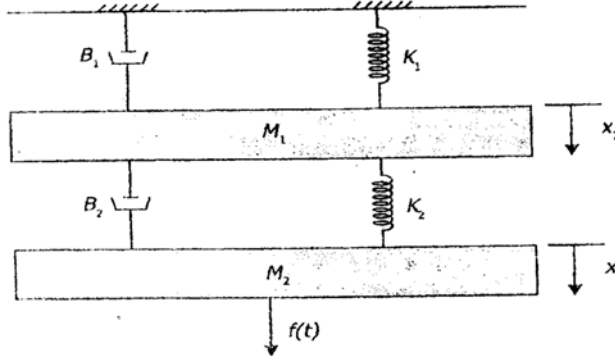
Total Marks: 70

Instructions:

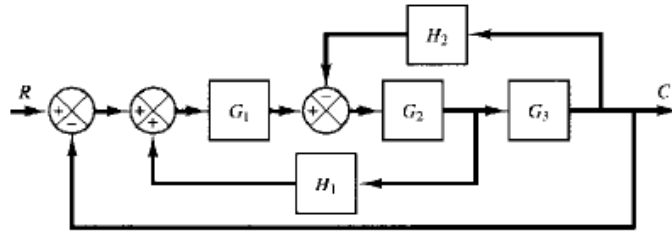
1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** (1) Define the following term. **02**
 I. Open loop control.
 II. Close loop control.

- (2) Obtain a system equation for the mechanical system shown in figure. **05**



- (b)** Solve the block diagram shown in Figure Obtain its transfer function. **07**



- Q.2 (a)** (1) What is the mathematical model? **02**

- (2) Obtain Transient response of first order systems to unit step input and obtain the value of steady state error. **05**

- (b)** What is a signal flow graph? What are Properties of signal flow graph? State and explain Mason's gain formula for signal flow graph. **07**

OR

- (b)** Sketch the root loci for the following system. **07**

$$G(s) = \frac{K}{s(s+1)(s+2)}, \quad H(s) = 1$$

P.T.O.

- Q.3 (a)** (1) Define the following term. **02**
 I. Rise time.
 II. Delay time.
- (2) An unity feedback system has a loop transfer function **05**

$$G(s) = 10(S+1)/S(S+2)(S+5)$$
 Determine:
 I. Stability gain.
 II. Step, ramp, parabolic error coefficient.
- (b)** Write a short note on state space representation of a control system. **07**
- OR**
- Q.3 (a)** (1) State 'Angle condition' and 'Magnitude condition' of root locus method. **02**
 (2) Explain in detail about Proportional control action. **05**
- (b)** Define programmable logic controller. What are the components of PLC? State the Advantages & Disadvantages of it. **07**
- Q.4 (a)** (1) What is root locus method? **02**
 (2) Write a short note on Adaptive Control System. **05**
- (b)** Describe a DC servomotor control system. Draw the simplified block diagram of the DC servo motor system. Derive the transfer function for the above system. **07**
- OR**
- Q.4 (a)** (1) Define Fuzzy Logic. **02**
 (2) Compare hydraulic and pneumatic control system. **05**
- Q.4 (b)** Describe working of hydraulic proportional plus derivative controller and derive expression for its performance. **07**
- Q.5 (a)** (1) Define hydraulic system. **02**
 (2) Write short note on Dashpots. **05**
- (b)** Describe working of hydraulic speed control for i.c. engine and derive expression for its performance. **07**
- OR**
- Q.5 (a)** (1) Define following term **02**
 I. Proportional lag.
 II. Controlled lag.
 (2) Find the stability of control system having following characteristic equation. **05**

$$a(s) = s^6 + 4s^5 + 3s^4 + 2s^3 + s^2 + 4s + 4.$$
- P.T.O.
- (b)** Consider the liquid-level control system shown in Fig. Assume that the set point of the Controller is fixed. Assuming a step disturbance of magnitude D_o , determine the error. Assume that D_o is small and the variations in the variables **07**

from their respective steady-state values are also small. The controller is proportional. If the controller is not proportional, but integral, what is the steady-state error?

