Sem-IV/Feedback Control system/INST (CBGS)

13-05-16

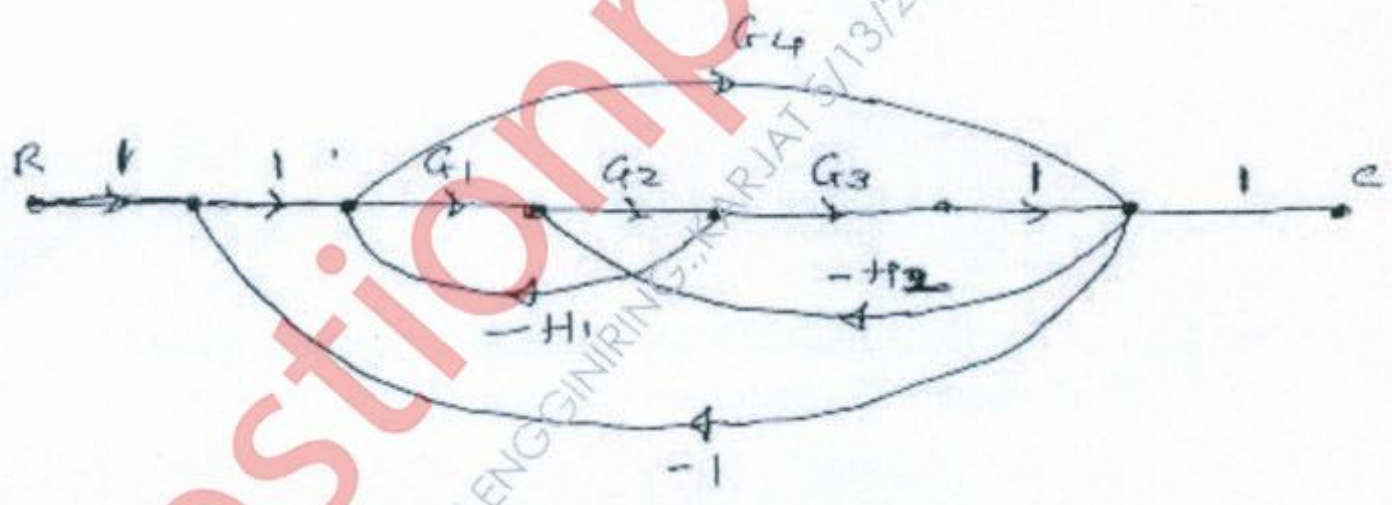
Q.P. Code : 551102

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No. **1** is **compulsory**
(2) Attempt any **three** questions out of **remaining five** questions
(3) Assume Suitable data, if necessary
(4) Figure to the right indicated full marks

1. Attempt any **four** **20**
   (a) Compare openloop and closed loop system
   (b) Explain Regenrative feedback
   (c) Explain the principle of superposition
   (d) Explain co-rrelation between time and frequency response
   (e) What is the errect of adding zeros to the system

2. (a) Obtain the overall transfer function C/R from the signal flow graph shown in figure. **10**



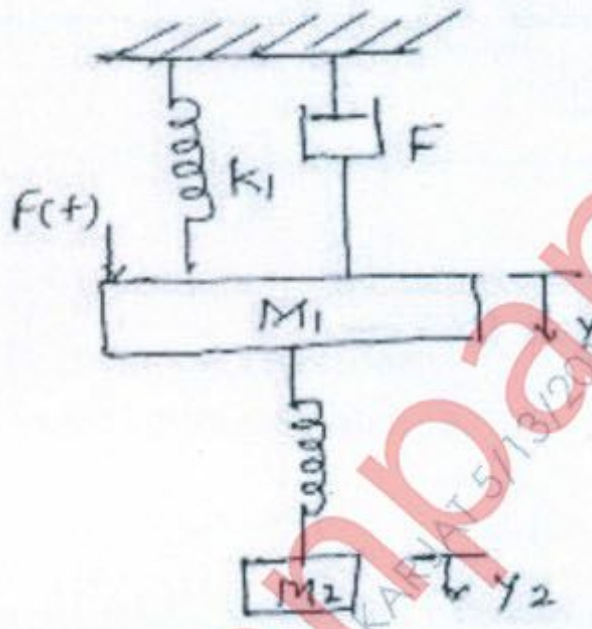
(b) A unity feedback control system has a open loop transfer function **10**

$G(s) = \frac{k}{s(s^2+4s+13)}$ sketch the rootlocus plot of a system. Find the value of K and frequency at which the root loci cross the jw axis.

3. (a) Sketch the bode plot and determine the gain cross over frequency for the transfer function given below. **10**

$$G(s) = \frac{4}{s(1+0.5s)(1+0.08s)}$$

(b) Write the differential equations governing the behaviour of mechanical system shown in figure. Also obtain an analogous electrical circuit based on Force-Voltage analogy. **10**



4. (a) The characteristic equations for a certain feedback control systems are given below. Deter mine the range of values of K for the system to be stable. **10**

(i) $s^4 + 22s^3 + 10s^2 + 2s + k = 0$

(ii) $s^4 + 12s^3 + 69s^2 + 198s + (20+k) = 0$

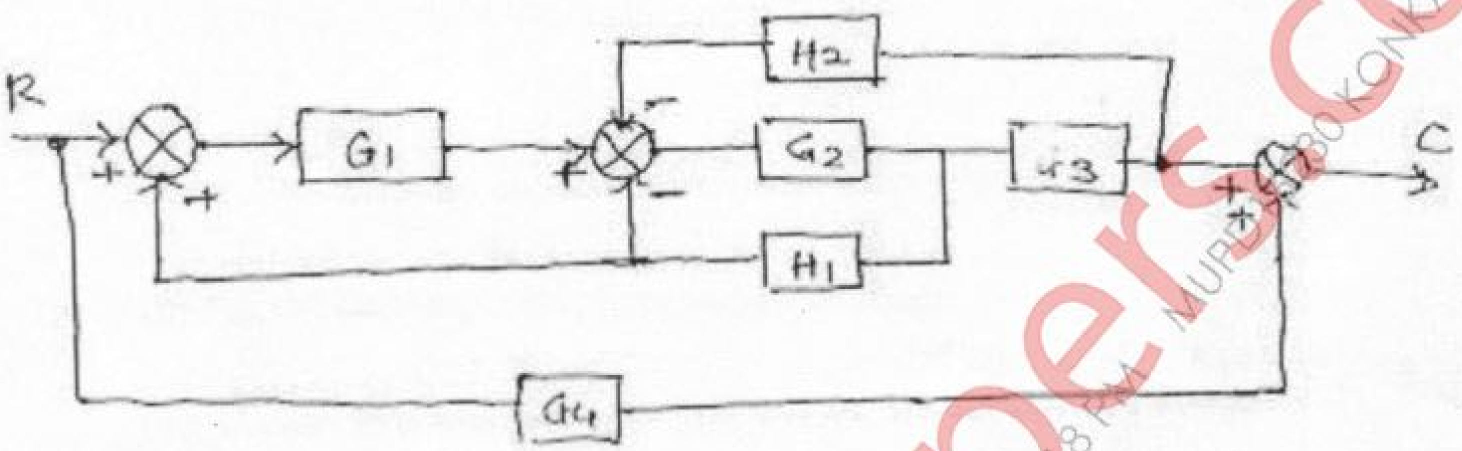
(b) The closed loop transfer function of the second order system is $\frac{C(s)}{R(s)} = \frac{wn^2}{s^2+2\xi wns+wn^2}$ obtain the equation for the output response c(t) for unit step input for under damped **10**

5. (a) (i) Sketch the polar plot of the transfer function given below **10**

$$G(s) = \frac{1}{(1+s)(1+2s)}$$

(ii) Define the gain margin and phase margin

(b) Using the block diagram reduction techniques, find the closed loop transfer function of the system given below. **10**



6. (a) (i) Explain the dominant condition **5**

(ii) Explain Nyquist stability criterion. **5**

(b) A unity feedback system has a tranfer function $G(s) = \frac{25}{s(s+8)}$ **10**

Determine damping ratio, peak overshoot Rise time and settling time.
