Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name: Control System Engineering

Subject Code: 4TE04CSE1   **Branch: B.Tech (EC)**

Semester: 4   Date: 16/05/2016   Time: 2:30 To 5:30   Marks :70

Instructions:
  (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  (2) Instructions written on main answer book are strictly to be obeyed.
  (3) Draw neat diagrams and figures (if necessary) at right places.
 (4) Assume suitable data if needed.

Q-1   **Attempt the following MCQ:**   **(14)**
  a) Write the equation of rotational system for inertia, damper and spring.
  b) What is feed back? Explain its effects of feedback.
  c) State the sink node.
  d) State the mason's gain formula.
  e) Define centroid.
  f) What is non touching loop?
  g) Draw close loop transfer function and write it's TF function
  h) What are the criteria for stable system?
  i) Draw mechanical translation system for mass and damper
  j) Define Transfer function.
  k) What is forward path?
  l) Define critical stable system.
  m) State the limitation of routh's stability.
  n) Write the rules used for the reduction of block diagram of a complex control system.

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**   **(14)**
  (a) Explain Missile launching and guidance system with neat sketch.
  (b) Give comparison of signal flow graph and block diagram method.

Q-3   **Attempt all questions**   **(14)**
  (a) What is bode plot? Write the procedure to bode plot and draw it.
  (b) Explain servomechanism system

Q-4   **Attempt all questions**   **(14)**

(a)   Obtain the overall transfer function C/R of the system whose signal flow graph shown in figure below
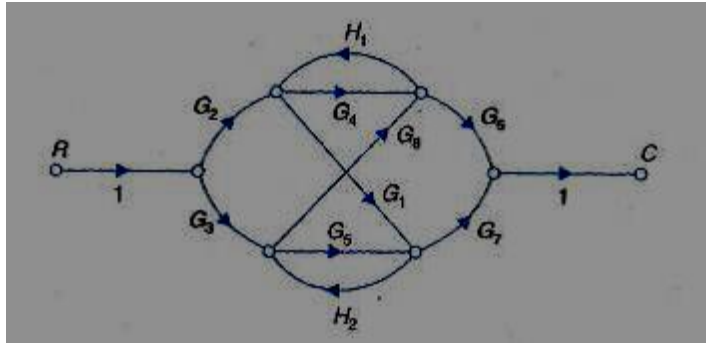
(b)   Using block diagram reduction technique find the closed loop transfer Function of the system whose block diagram is given in figure below.
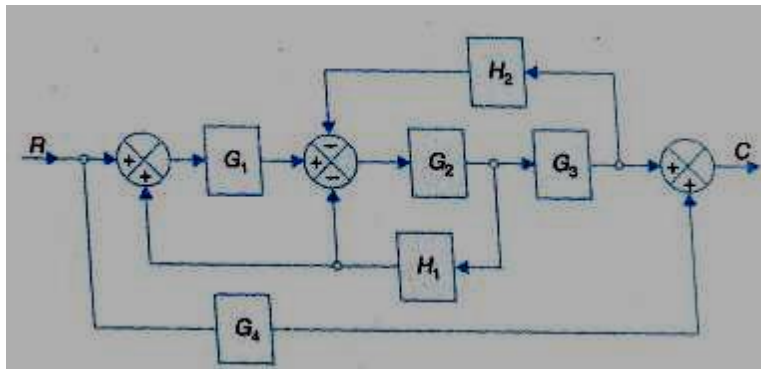
Q-5   **Attempt all questions**   (14)
(a)   Write comparative note on open loop control systems and closed loop control systems. Discuss their advantages and disadvantages too.
(b)   State and explain Nyquist stability criterion. Write advantages and limitations of the Nyquist stability criterion.

Q-6   **Attempt all questions**   (14)
(a)   Feedback control system has an open loop transfer function
            Find the root locus.
            $$G(s)H(s) = \frac{K}{s\,(s+3)(s^2+2s+2)}$$

(b)   What do you mean by a polar plot? What is the advantage of polar plots? What is the inverse polar plot?
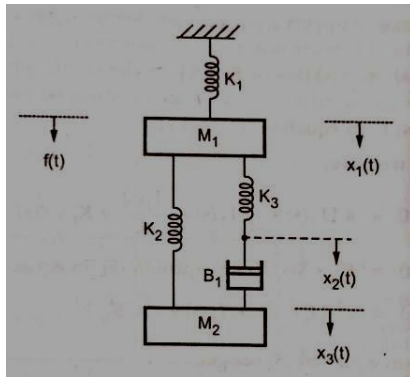
Q-7   **Attempt all questions**   (14)

(a) Find the root locus. The open loop transfer function is given below

$$G(s)H(s) = \frac{K}{s\,(s+4)(s^2+4s+20)}$$

(b) Draw the equivalent mechanical system for the given system as per below figure. Hence write a set of equilibrium equations and obtain electrical analogous circuit using F-V analogy

Q-8 **Attempt all questions** (14)

(a) Determine the stability of the system whose overall transfer function is given by

$$\frac{C(s)}{R(s)} = \frac{2s + 5}{s^5 + 1.5s^4 + 2\,s^3 + 4s^2 + 5s + 10}$$

If the system is found unstable, how many roots it has with positive real parts?

(b) The characteristics equation of servo system is given by
$$a_0\,s^4 + a_1\,s^3 + a_2\,s^2 + a_3\,s + a_4 = 0$$

Determine the conditions which must be satisfied by the coefficient of the characteristics equation for the system to be stable. ($a_0 > 0$)