T.E. Electronics & telecom.cation Sem V
Rev.
Principle of control systems

25 : mT-G-1stHf10

Con. 4025-10.   (REVISED COURSE)   AN-4282

(3 Hours)   [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
    (2) Answer any **four** out of remanining **six** questions.
    (3) **Figures** to the **right** indicate **full** marks.
    (4) Illustrate answers with **sketches** wherever **required.**

1. (a) Define sensitivity. How can we reduce the sensitivity of closed loop system ?   **20**
   (b) State the properties of Transfer function.
   (c) Explain Hurwitz Stability Criterion. What are the Disadvantages ?
   (d) What are the advantages of Bode Plot ?

2. (a) Determine the value of $V_0(t)$ if —   **10**
       $C_2 = 5C_1$
       $V_i(t) = 40 \cdot e^{-20t}$
 $C_1 = 0.5\ uf$
       $R = 100\ m\Omega$
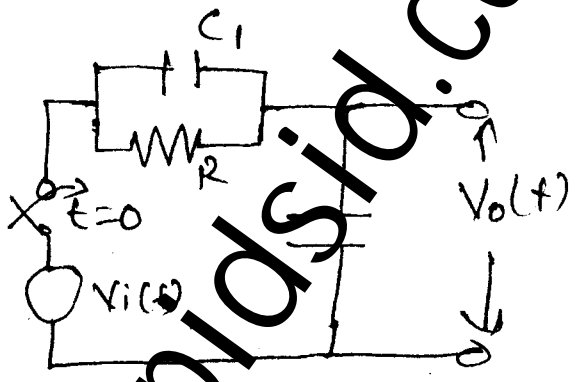
   (b) Explain the effect of an additional zero and additional pole to the standard second   **10**
     order system.

3. (a) Consider the following block diagram shown in **figure** below. Draw its equivalent   **10**
     signal flow graph and find C(s)/R(s) using Mason's gain formula.
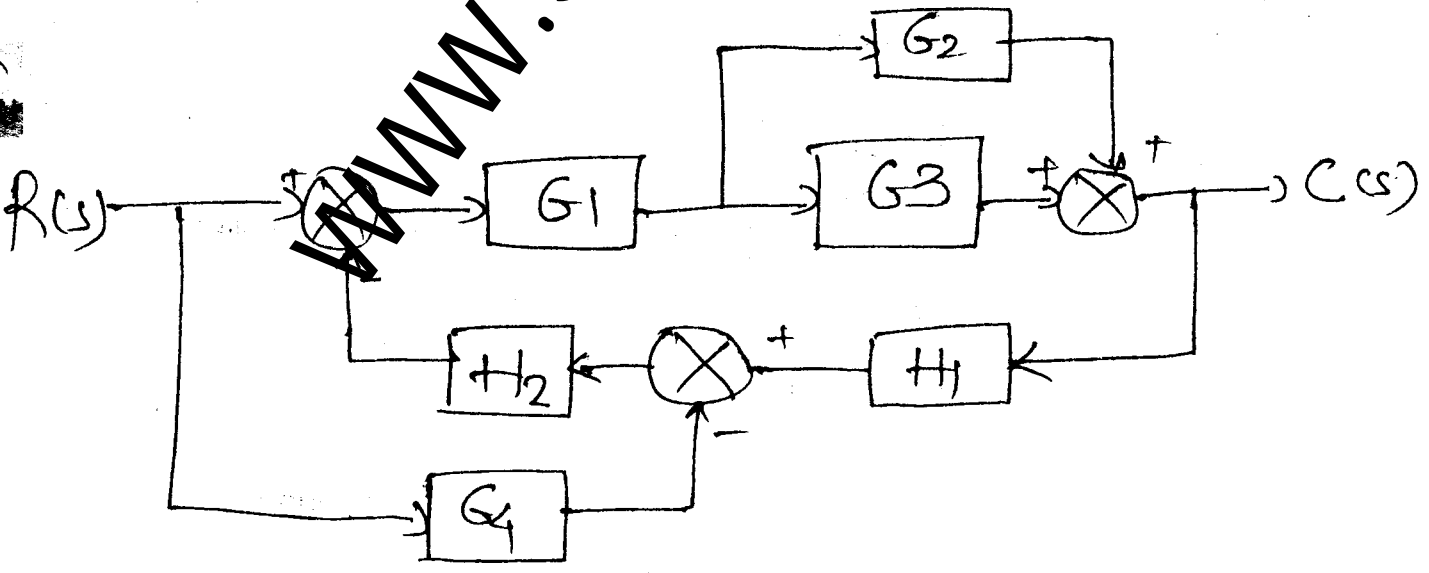
   (b) Derive the transfer function of armature controlled dc servomotor and obtain the   **10**
     resulting block diagram.

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4. (a) Using block diagram reduction rule, obtain the transfer function of the system shown **10** in **figure** below :—
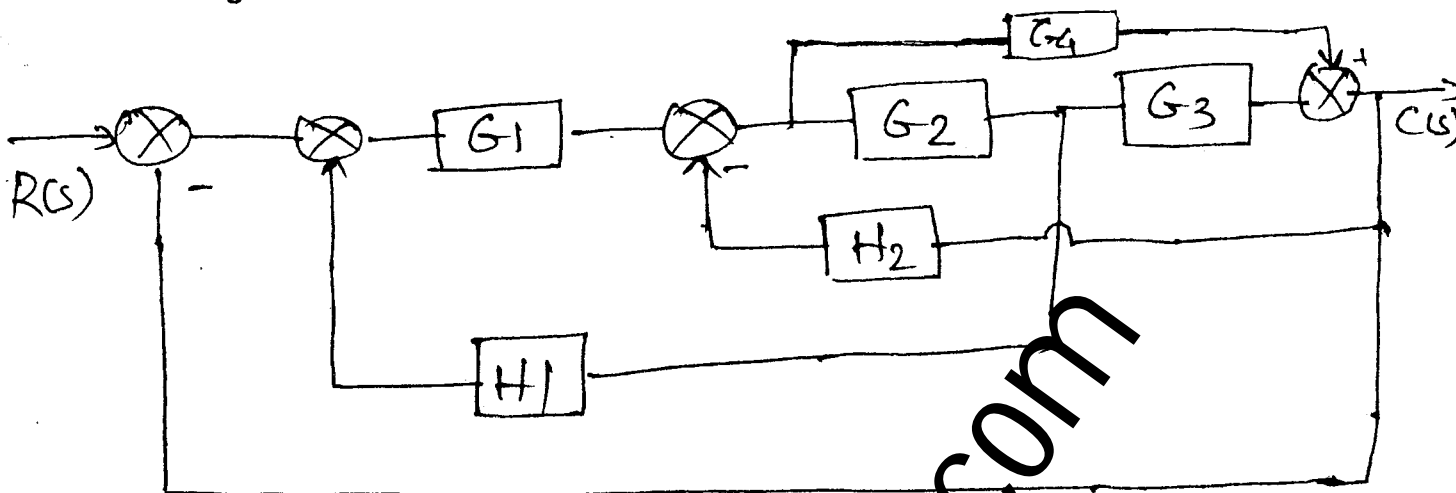
(b) The open loop transfer function of a feedback system is —

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

Draw complete root locus. Determine value of K for stability. Determine oscillation frequencies.

5. (a) Determine the value of K for unity feedback control system having — **10**

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

    (i) Phase margin = $60°$
    (ii) Gain margin = 20 dB

(b) Derive and analyse the response of a second order system to a unit step. With the **10** help of graphical plots explain the significance of damping ratio for its various values.

6. (a) The output of a control system is related to its input by — **12**
    $(s^4 + 2s^3 + 2s^2 + (3 - K)\,s + K)\,C(s) = K(s + 1)\,R(s)$
Where K represents the positive gain of an amplifier.
    (i) With K = 6 and a step input will the output response be stable ?
    (ii) Determine the limiting value that K can have for a stable output response.

(b) Obtain the Transfer function of field controlled D.C. Motor. Draw block diagram. **8**

7. Write short notes on any **two** of the following :— **20**
    (a) A. C. Servomotors
    (b) Tachogenerators
    (c) Error compensation methods and their effects on system performance.