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Total No. of Pages : 03

Total No. of Questions : 09

**B.Tech.(Electronics Engg.)/(Electrical Engineering & Industrial Control)
(2012 Onwards)****B.Tech.(ECE/EE/Electrical & Electronics/Electronics & Computer Engg./
Electronics & Electrical/ETE) (2011 Onwards)****(Sem.-4)****LINEAR CONTROL SYSTEMS****Subject Code : BTEE-402****Paper ID : [A1188]****Time : 3 Hrs.****Max. Marks : 60****INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A**1. Answer briefly :**

- (a) What is the need of a control system? Explain.
- (b) Define transfer function.
- (c) What is the significance of time constant in first order systems?
- (d) Why Bode plot is drawn on semi log paper?
- (e) How Nyquist criterion is different from Routh-Hurwitz criterion?
- (f) Define gain and phase margin.
- (g) What do you mean by steady state error? Explain.
- (h) List the various characteristics of servo motors.
- (i) Discuss in brief applications of lead and lag compensation.
- (j) Why compensation is required? Explain.

SECTION-B

2. Determine the ratio $\frac{Y(s)}{X(s)}$ of the system whose block diagram is shown in the figure 1.

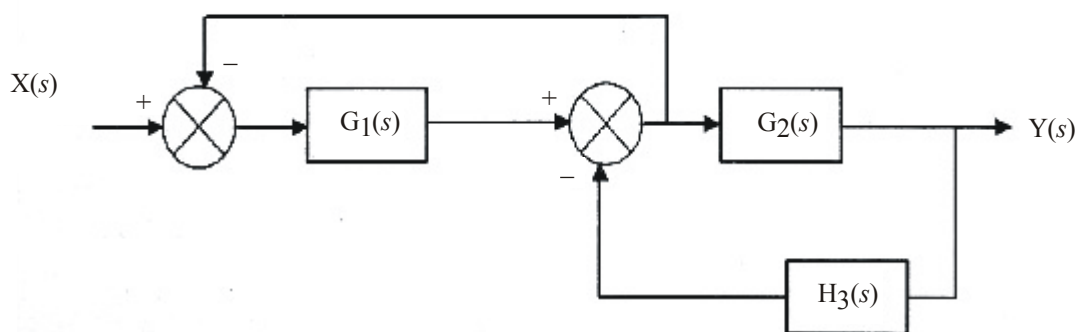


Figure - 1

3. Discuss in detail the (by considering examples) open loop and closed loop systems. Which out of these controls is preferred and why?
4. Determine the stability of the system using Routh-Hurwitz criteria whose characteristics equation is given by

$$s^5 + 13s^4 + 54s^3 + 82s^2 + 170s + 330 = 0$$

5. For a unity feedback control system the forward path transfer function is given by

$$G(s) = \frac{20}{s(s+2)(s^2+2s+20)}$$

Determine the steady state error of the system when the input is $2t$.

6. For the root locus of a system having open loop transfer function

$$G(s)H(s) = \frac{K}{s(s+1)(s+3)}$$

Determine the Asymptotes to the loci and breakaway points.

SECTION C

7. Draw the time response of a underdamped second order system when subjected to unit step input and define the following :
- (a) Rise time
 - (b) Peak time
 - (c) Maximum overshoot
 - (d) Settling time
8. Construct the Bode plot of the system whose open loop transfer function is given by

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

9. **Write short notes on the following :**
- (a) Series and parallel compensation
 - (b) Magnetic Amplifier