Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (Electronics Engg/ECE/Electronics & Electrical Engg/Electrical Engineering & Industrial Control/Electronics & Computer Engg) (2012 to 2017)/B.Tech.(EE/Electrical & Electronics Engg.)

(2012 Onwards) (Sem.–4)

LINEAR CONTROL SYSTEMS

Subject Code : BTEE-402

M.Code : 57105

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

Answer briefly :

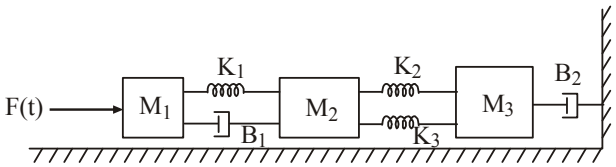
1. Explain the importance and need of compensation.
2. Find the restriction of K so that closed loop system given by the following characteristic equation is absolutely stable.

$$s^3 + 2Ks^2 + (K+2)s + 4 = 0$$

3. Define Nyquist criterion.
4. Explain the effect of ξ on the output response of any system.
5. Differentiate between break away and break in points.
6. Describe the output response of type-I and type-II systems for ramp input.
7. Derive the mathematical model of a series RLC circuit.
8. Evaluate the static error coefficients for unit step input for the system having :

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

9. Give the F-V and F-I analogy for the following system :



10. Explain the effect of the location of poles on the stability of any system.

SECTION-B

11. Derive the frequency domain specifications M_r and ωr for a second order system and correlate them with their time domain specifications.

12. For the system represented by the given equations find C/R using SFG technique only.

$X_2 = G_1X_1 - H_lX_3 - H_2X_4 - H_3X_5$

$X_3 = G_2X_2 - H_4X_5$

$X_4 - G_3X_3 + G_5X_4$

$X_5 = G_4X_3 + G_6X_4$

13. A unity feedback system having open loop transfer function as :

$$G(s) = \frac{K(s+1)}{s^3 + as^2 + 2s + 1}$$

System oscillates with frequency ω. Determine the values of 'K' and 'a' so that the system oscillates at a frequency of 2 rad/sec.

14. The open loop transfer function of a unity feedback control system is :

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

By what factor the amplifier gain K should be reduced so that Mp of unit step response of the system is reduced from 80% to 30%?

15. Write a short note on working of synchros as error detector.

SECTION-C

16. Construct the bode plot for the system whose open loop transfer function is given below and determine (a) gain margin (b) phase margin (c) closed loop stability.

$$G(s)H(s) = \frac{512(s+3)}{s(s^2+16s+256)}$$

17. Sketch the root locus for the open-loop transfer function of a unity feedback control system given below and find : (a) value of K for marginal stability (b) frequency of oscillations.

$$G(s) = \frac{K}{s(s^2+4s+8)}$$

18. State the necessity of compensation. Derive the transfer function of phase lead and phase lag compensator along with the circuit diagrams and state the advantages and limitations.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.