Roll No. | | | | | | | | | | | | |

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2011 & Onward) (Sem.–4)

LINEAR CONTROL SYSTEMS

Subject Code : BTEE-402

Paper ID : [A1221]

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

Q1. Write briefly :

a. Draw circuit of Phase lead network and state the advantages of using it.

b. Why is compensation required?

c. Draw and define any two time domain characteristics for step input to a second order system.

d. Define dead time and steady state error.

e. Define the term Damping ratio and discuss its effects on the output of any system.

f. Define Nyquist criterion.

g. What do you mean by Phase margin and Gain Margin?

h. What is the difference between Break-in and Break away Point?

i. What do you mean by Sampled Data control system?

j. Draw the F-V and F-I analogous circuit for following circuit of Fig. 1

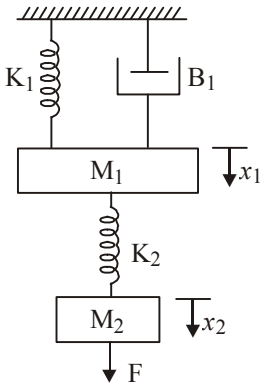

Fig. 1

SECTION-B

Q.2 The open loop transfer function of a unity feedback control system is given by :

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

By what factor the amplifier gain K should be multiplied so that the damping ratio is increased from 0.25 to 0.9.

Q.3 Derive the co-relation between Mp, Mr and ωr, ωd. Derive their relations and explain them graphically.

Q.4 The open loop transfer function of a ufb control system is given by :

$$G(s) = \frac{K}{(s)(1+0.4s)(1+0.25s)}$$

By applying Routh Criterion, discuss the stability of the closed loop system as a function of K. Determine the value of K which will cause sustained oscillations in the closed loop system and also find corresponding oscillation frequencies.

Q.5 Derive mathematical model for field controlled dc motor.

Q.6 Describe potentiometers as error detector.

SECTION-C

Q.7 For the system represented by the given equations find C/R using SFG technique only.

$$X_2 = G_1X_1 - H_1X_3 - H_2X_4 - H_3X_5$$

$$X_3 = G_2X_2 - H_4\,X_5$$

$$X_4 = G_3X_3 + G_5\,X_4$$

$$X_5 = G_4\,X_3 + G_6X_4$$

Q.8 Plot the Root Locii for the closed loop control system with :

$$G(s) = \frac{K}{s(s^2 + 4s + 13)}$$

Q.9 Sketch the Bode Plot for the transfer function :

$$G(s) = \frac{16(1 + 0.5s)}{s^2(1 + 0.125s)(1 + 0.1s)}$$