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:

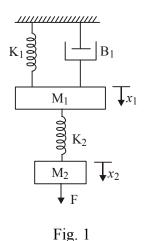
- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

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

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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.

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SECTION-C

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

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

$$X_3 = G_2X_2 - H_4X_5$$

$$X_4 = G_3X_3 + G_5X_4$$

$$X_5 = G_4X_3 + G_6X_4$$

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:

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

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