





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  $M_p$ ,  $M_r$  and  $\omega_r$ ,  $\omega_d$ . 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.

$$X_2 = G_1 X_1 - H_1 X_3 - H_2 X_4 - H_3 X_5$$

$$X_3 = G_2 X_2 - H_4 X_5$$

$$X_4 = G_3 X_3 + G_5 X_4$$

$$X_5 = G_4 X_3 + G_6 X_4$$

Q.8 Plot the Root Loci 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 :

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