

Code No: R22026

**R10**
**SET - 1**
**II B. Tech II Semester Supplementary Examinations, November -2018**
**CONTROL SYSTEMS**

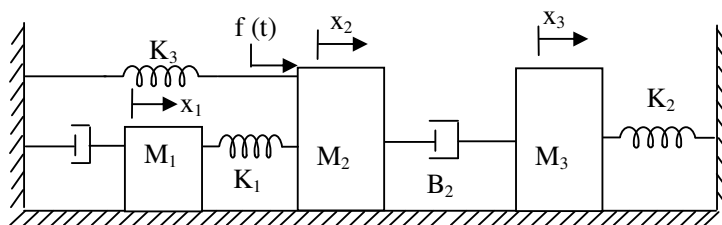
(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours

Max. Marks: 75

 Answer any **FIVE** Questions  
 All Questions carry **Equal** Marks  
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1. a) Describe the effect of feed back on system performance (8M)
- b) Obtain the mathematical model of the mechanical system shown in below Figure (7M)



2. a) Obtain the transfer function of AC servo motor from first principles (8M)
- b) Draw the signal flow graph for the equations given below and obtain the overall gain of the system (7M)

$$X_2 = X_1 - X_6$$

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

$$X_4 = G_2 X_3 - H_4 G_6$$

$$X_5 = G_5 X_4$$

$$X_6 = G_4 X_5$$

3. a) Explain the different types of time domain specifications (8M)
- b) An unity feedback system is given as  $G(S) = \frac{1}{S(S+2)}$ . the input to the system is (7M)

 described by  $r(t) = 4 + 6t + 2t^3$ . Find the generalized error coefficients and the steady state error

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4. a) Describe the limitations of Routh's stability (8M)  
 b) Develop the root locus for the following openloop system, (7M)

$$G(S)H(S) = \frac{5}{S(S+4)(S^2+2S+1)}$$

5. Sketch the bode plot for the transfer function, (15M)

$$\frac{100(S^2+2S+4)}{S(S+10)(S+20)}. \text{ Find G.M and P.M}$$

6. Apply Nyquist stability criterion to the system with loop transfer function (15M)

$$G(S) = \frac{(4S+1)}{S^2(S+1)(2S+1)}.$$

(7M)

7. a) Explain the effects and limitations of phase-lead compensation (8M)  
 b) Explain about the PID controllers (7M)

8. a) Define (i) state variable, (ii) state, (iii) state vector, (iv) state equation, (v) state model (8M)

- b) For the matrix given find the diagonalization matrix, (7M)

$$A = \begin{bmatrix} 3 & -2 \\ -1 & 2 \end{bmatrix}.$$