

Code No: RT22026

R13
SET - 1
II B. Tech II Semester Supplementary Examinations, November-2018
CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

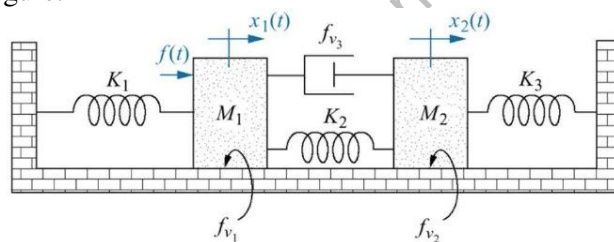
- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Explain how feedback effects Overall gain of the system (4M)
- b) Give the Effects of proportional derivative systems (4M)
- c) What are the limitations of Routh's stability (4M)
- d) Explain the concept of gain margin. (4M)
- e) Explain Lag compensation (3M)
- f) State and explain the observability tests (3M)

PART -B

2. a) Explain open loop control system and closed loop control system with example. (8M)
- b) Find the transfer function $\frac{X_2(s)}{F(s)}$ for the Mechanical translation system shown in figure. (8M)



3. a) Write the equations for time domain specifications of a standard second order system with unit step input? (8M)
- b) A unity feedback system with closed loop transfer function is $\frac{C(s)}{R(s)} = \frac{Ks+b}{s^2+as+b}$. (8M)
 Show that the steady state error with unit ramp input is $\frac{(a-K)}{b}$.
4. a) Construct Routh array, determine stability and find the location of roots for the systems represented by the following characteristic equation. (8M)
 $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$
- b) List all the rules to construct a root locus and explain. (8M)

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5. a) Draw the bode plot for the unity feedback system with open loop transfer function (8M)

$$G(s) = \frac{0.5}{s(s^2 + s + 1)} \text{ Hence find gain margin and phase margin.}$$

- b) Draw the bode plot for a system having $G(s)H(s) = \frac{100}{s(s+1)(s+2)}$. Find (8M)

(i) Gain margin

(ii) phase margin

6. a) Discuss about the design aspects of lead compensator using frequency response method (8M)

- b) The open loop transfer function of certain unity feedback control system is given by (8M)

$$G(s) = \frac{K}{s(s+4)(s+80)} \text{ It is desired to have the phase margin to be at least } 33^\circ$$

and

 the velocity error constant $K_v = 30 \text{ sec}^{-1}$. Design a phase lag series compensator

7. a) Explain various methods of evaluation of state transition matrix (8M)

- b) The state equations of a Linear system are as follows. (8M)

$$\dot{\bar{x}} = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -3 & 0 \\ 1 & 1 & 1 \end{bmatrix} \bar{x} + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u \quad ; \quad y = [2 \ 1 \ -1] \bar{x} \text{ Determine the transfer function } y(s)/u(s).$$