Reg. No. : | | | | | | | | | | |

Question Paper Code: 54522

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Fourth Semester

Electronics and Communication Engineering

01UEI422 – LINEAR CONTROL ENGINEERING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

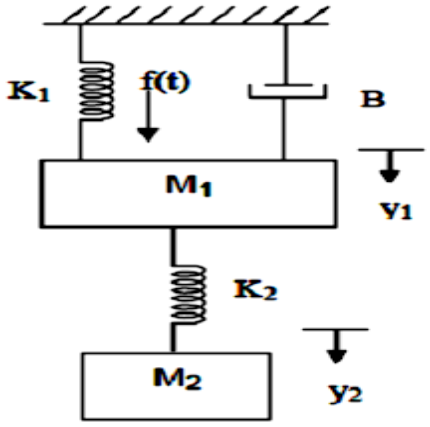
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Write Masons Gain formula.
2. List the basic properties of signal flow graph.
3. Why derivative controller is not used in control systems?
4. List the time domain specifications.
5. List out the different frequency domain specifications.
6. Define Phase cross over and Gain cross over frequency.
7. How the roots of characteristic are related to stability?
8. Define Relative stability. What is the necessary condition for stability?
9. What are the advantages of State Space analysis?
10. State the reason for using state space analysis rather than using transfer function method.

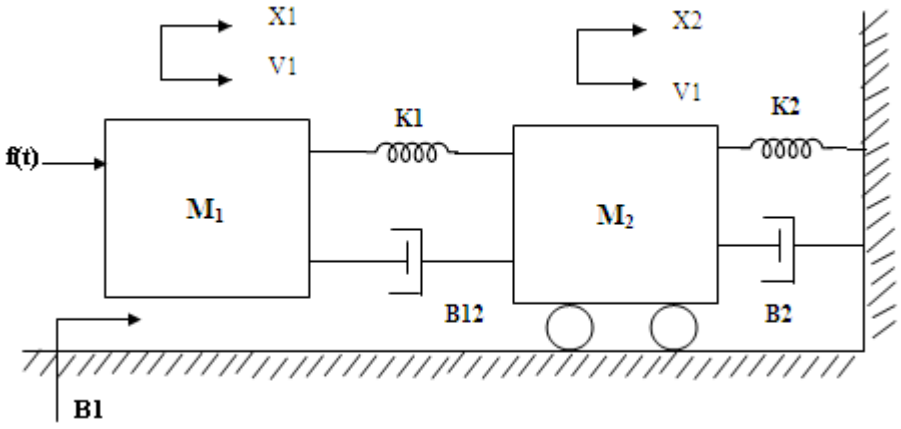
PART - B (5 x 16 = 80 Marks)

11. (a) Write the differential equations governing the mechanical system shown in figure and determine the transfer function. (16)



Or

(b) Write the differential equations governing the mechanical system shown in Fig. 3. Draw the force-voltage and force-current electrical analogous circuits and verify by writing mesh and node equations. (16)



12. (a) Derive the expression for the response of first order system for unit step input. (16)

Or

(b) For servomechanism with open loop transfer function given below explain what type of input signal give rise to a constant steady error and calculate their value. Given $G(s) = \frac{10}{(s+2)(s+3)}$. (16)

13. (a) A unity feedback control system has $G(s) = \frac{K}{s(s+4)(s+10)}$. Draw the Bode plot. Find *K* when phase margin 30°. (16)

Or

(b) (i) Determine the range of values of *K* for the system to be stable.

$s^3 + 3Ks^2 + (K+2)s + 4 = 0$ (6)

(ii) Check the stability of the following system using Nyquist stability criterion $\frac{10}{(s+1)^3}$ (10)

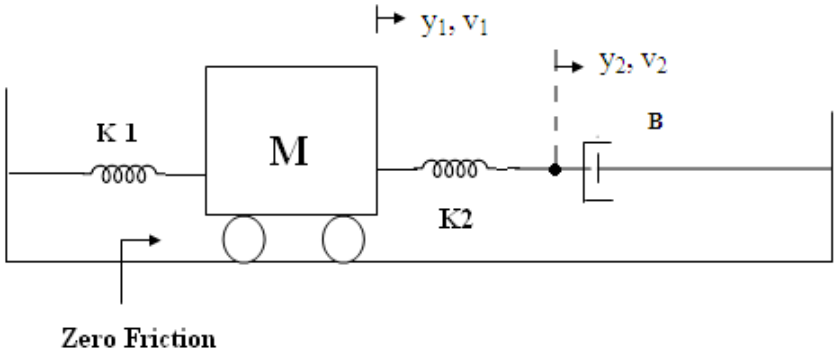
14. (a) Determine the range of values of K for the system to be stable.

$s^3 + 3Ks^2 + (K+2)s + 4 = 0$. (16)

Or

(b) A certain unity negative feedback control system has the following open loop transfer function $G_H(s) = K / [s(s + 1) (s + 3)]$. Draw the root locus for $0 < k <$ infinity. (16)

15. (a) Obtain the state model of the mechanical system shown in Fig. 4 by choosing a minimum of three state variables. (16)



Or

(b) Determine the State transition matrix for the state model whose A matrix is given by

(i) $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ (ii) $A = \begin{bmatrix} 0 & 1 \\ 1 & -2 \end{bmatrix}$. (16)

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