Code.No: 45106 | R07 | SET-1

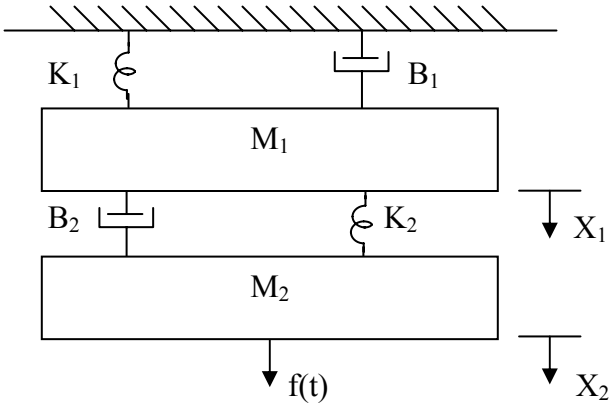
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
III.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOVEMBER, 2009
CONTROL SYSTEMS
(Common to EIE, AE)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

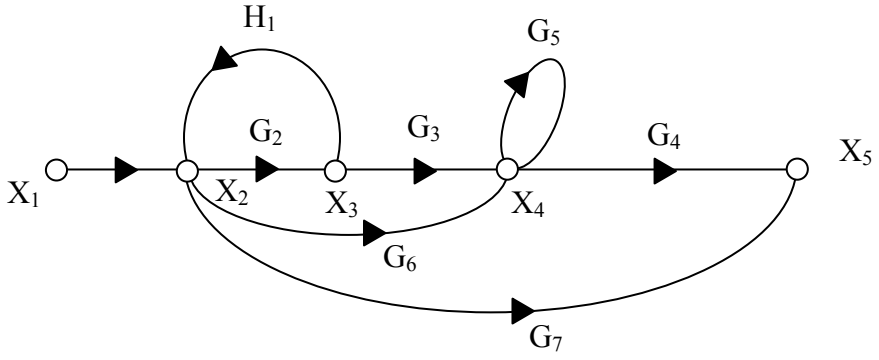
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1.a) Mention the merits and demerits of an open-loop and closed-loop control systems.
b) Obtain the transfer function $X_1(s)/F(s)$ for the mechanical system shown below:



c) Obtain the transfer function of a field controlled D.C. motor. [5+5+6]

2.a) Explain the working of synchro transmitter and receiver system. Derive its transfer function.
b) For the signal flow graph shown below, determine the gain X_5/X_1 using Mason's gain formula: [8+8]



3.a) Derive output responses of the standard second order system and draw step response of the system.

b) Find the Error coefficients for step, ramp and parabolic inputs for unity feed-back system having the forward transfer function [8+8]

$$G(s)=\frac{14(s+3)}{s(s+5)(s^2+2s+2)}$$

4. A unity feedback system has the following open- loop transfer function:

$$G(s)=\frac{K(s+3)}{s(s^2+2s+2)(s+5)(s+6)}$$

Sketch the root-locus diagram. Calculate the value of K corresponding to the damping ratio equal to 0.42. Give the steps followed for construction of Root locus. [16]

5.a) Explain clearly the steps involved in the construction of Bode plots of a system with loop transfer function consisting of

i. An open loop gain K

ii. One pole at the origin

iii. One quadratic factor

b) Given $G(s)=\frac{(s-5)}{(s+5)}$. Determine the phase angle at 0, 5 & 1 frequencies. [12+4]

6.a) Explain Nyquist stability criterion.

b) With the help of Nyquist plot assess the stability of a system

$G(s)=\frac{3}{s(s+1)(s+2)}$. What happens to stability if the numerator of the function is changed from 3to 30? [6+10]

7.a) Explain the need of lead compensator and obtain the transfer function of lead- lag compensator.

b) Explain the significance of compensation? [10+6]

8.a) Considering the vector matrix differential equation describe the dynamics of the system as $X=\begin{bmatrix}0 & 1\\ -6 & -5\end{bmatrix}$. Determine state transition matrix?

b) What are the properties of state transition matrix? [10+6]