Code: 9A02503

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

CONTROL SYSTEMS

(Common to EEE, E.Con.E, EIE, ECE and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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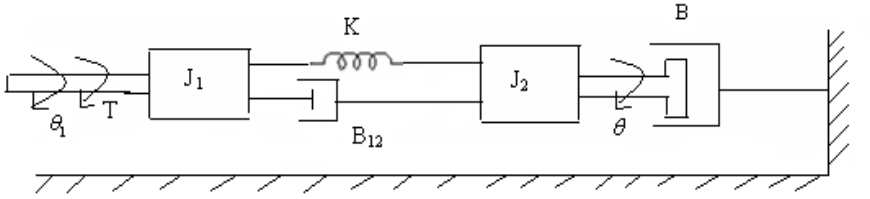
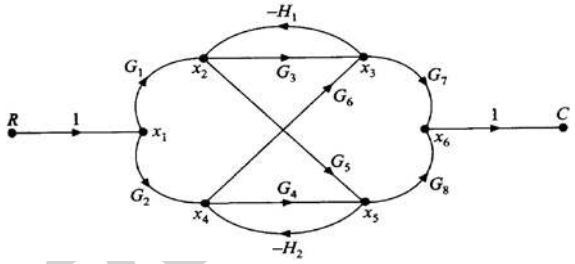
1 (a) Explain the classification of control systems.

(b) Write the differential equations governing the mechanical rotational system shown in the figure.



2 Using mason gain formula find the transfer function C/R for the signal flow graph shown in figure.



3 (a) Explain about various test signals used in the control systems.

(b) For the servomechanism with open loop transfer function given below, what types of input signal gives rise to a constant steady state error and calculate their values.

$G(s) = 10/ [s^2(s + 1) (s + 2)]$.

4 (a) Explain the Routh-Hurwitz criterion to determine the stability of the system.

(b) Examine the characteristic equation $s^4 + 2s^3 + s^2 + 4s + 2 = 0$ for stability.

5 (a) Explain the procedure to determine the transfer function from Bode plots.

(b) Draw the Bode phase plot for the system having the following transfer function:

$G(s) = 20/[s(1 + 3s)(1 + 4s)]$

6 With the help of Nyquist plot assess the stability of the system $G(s) = 3/s(s + 1) (s + 2)$. What happens to the stability if the numerator of the function is changed from 3 to 30?

7 The open loop transfer function of a certain unity feedback control system is given by $G(s) = K/s(s + 4) (s + 80)$. It is desired to have the velocity error constant, $K_v = 30$ sec^{-1} and the phase margin to be at least 33^0. Design a phase lag series compensator.

8 (a) Obtain state variable representation of a field controlled D.C motor.

(b) Find the state transition matrix for a given system matrix. $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$

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