Code: 9A02503

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

CONTROL SYSTEMS

(Common to EEE, E.Con.E, EIE & ECE)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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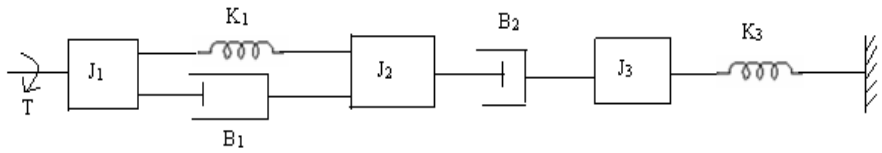
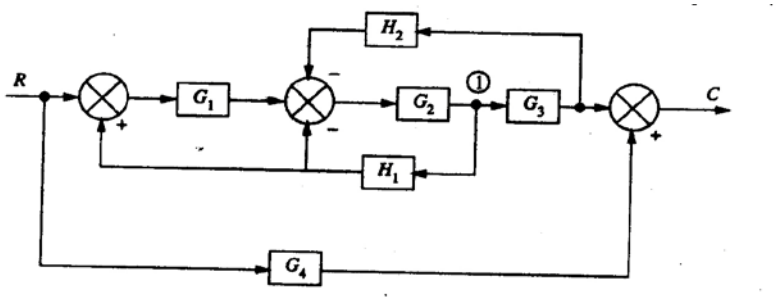
1 Write the differential equations governing the mechanical rotational systems shown in figure. Draw the torque-voltage and torque-current electrical analogous circuits and verify by writing mesh and node equations:



2 Find the transfer function shown in figure using block diagram algebra.



3 (a) Draw the transient response of a second order system and define all the specifications for under damped case?

(b) For a unity feedback control system the open loop transfer function G(s) = 10(s+2)/ s^2(s+1), find the steady state error when the input R(s) = (3/s)-(2/ s^2) + (1/3 s^3).

4 (a) What are the necessary and sufficient conditions to investigate the stability of the system using Routh-Hurwitz criterion?

(b) Factorize the given polynomial using Routh– Hurwitz criterion:
F(s) = s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16=0.

5 (a) Given G(s) = (s-5) / (s+5) Determine the Phase angle at 0, 5 & infinite frequencies.

(b) Draw the Bode phase plot for the system having the following transfer function:
G(s) = 5 (1+2s) / [(1+4s) (1+0.25s)].

6 Sketch the polar plot for following transfer function and from the plot determine the phase margin and gain margin: G(s) = [(1+0.2s) (1+0.025s)] / [s^3 (1+0.005s) (1+0.001s)].

7 Explain the different steps to be followed for the design of a lag compensator using Bode plot.

8 Find the transfer function from the A, B, C matrices of a state model.

$$A=\begin{bmatrix} -2 & 1 & 0 \\ 0 & -3 & 1 \\ -3 & -4 & -5 \end{bmatrix} \quad B=\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C=\begin{bmatrix} 0 & 1 & 0 \end{bmatrix}$$

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