Code No: 09A50204 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year I Semester Examinations, June/July - 2014
CONTROL SYSTEMS
(Common to EEE, ECE, ETM)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) What is feed back? Explain the effects of feedback.
b) Find the transfer function of the network given figure 1.

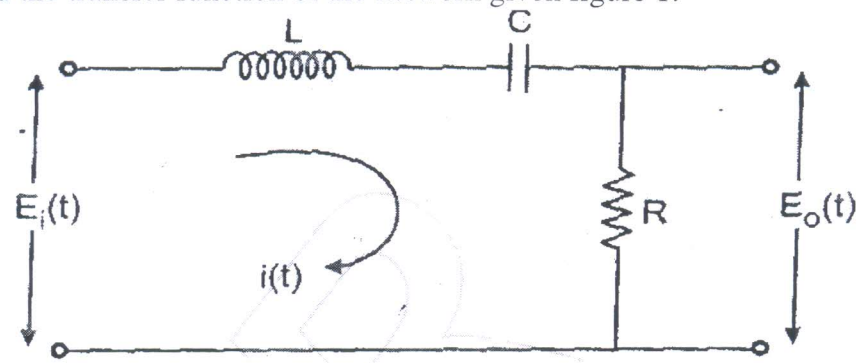

Figure: 1

2.a) Derive the transfer function for the armature controlled D.C servomotor with neat sketch.
b) For the signal flow graph shown in figure 2, determine the gain X_5/X_1 using Mason's gain formula.

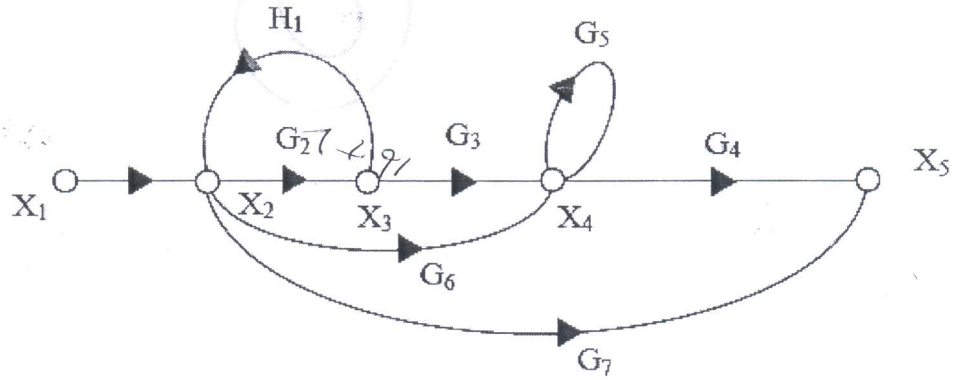

Figure: 2

3.a) Find the Error coefficients for step, ramp and parabolic inputs for unity feed-back system having the forward transfer function.

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

b) Why derivative controller is not used in control systems? What is the effect of PI controller on the system performance?

4.a) How RH Stability criterion can be used to study the relative stability?

b) Obtain the root locus plot for the system whose open loop transfer function is $G(s)=\frac{K}{s(s+1)(s^2+2s+2)}$ for what range of 'K' the system is stable?

5.a) Define:
i) Minimum phase tf.
ii) Non minimum phase tf.

b) Enlist the steps for the construction of Bode plots.

c) Explain the procedure for determination of transfer function from Bode plots.

6.a) Draw and explain polar plots for type-0, type-1 and type-2 systems.

b) Write a note on relation between root loci and Nyquist plots.

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

8.a) Explain the significance of State Space Analysis.

b) 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.

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