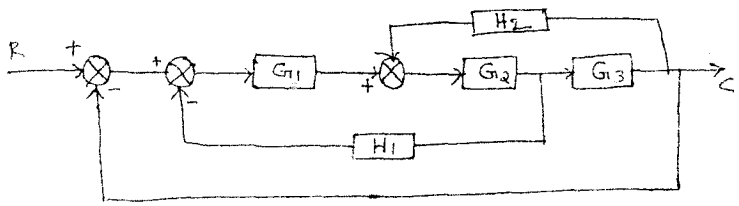
B. Tech Degree VI Semester (Supplementary) Examination September 2010

CS/EC/EB/EI 605 CONTROL SYSTEMS ENGINEERING

(2002 Scheme)

Time : 3 Hours Maximum Marks : 100

I. (a) Determine the transfer function C/R of a system shown in figure using block diagram reduction method. Verify the results using Mason's gain formula. (15)



(b) Distinguish between open loop systems and closed loop systems. (5)

OR

II. (a) Derive the transfer function of armature controlled d.c.motors. (15)

(b) What is a signal flow graph? How do you get it from a block diagram? (5)

III. (a) Using Routh Hurwitz stability criterion, for the *ufb* system with open loop transfer function $G(s)=\dfrac{k}{s(s+1)(s+2)(s+5)}$.

(i) Find the range of k for stability.

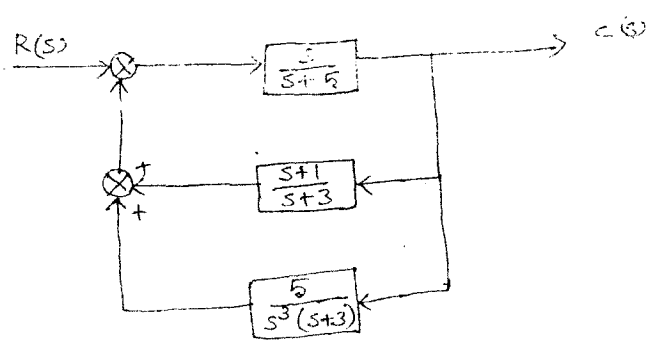
(ii) Find the value of k for marginally stable. (15)

(b) Plot the step response of a second order system and mark the different time domain specifications. (5)

OR

IV. (a) A system has unit response $C(t)=1-e^{-0.1t}$. Determine its unit impulse and ramp response. (10)

(b) Find the error coefficients of the system.



(10)

(P.T.O)

V. (a) Explain frequency domain specifications. (5)

(b) Plot the Bode diagrams for the open loop transfer function of a unity feedback system having $G(s)=\frac{1}{s(1+0.5s)(1+0.1s)}$. Determine the gain margin and phase margin of the system. (15)

OR

VI. (a) Explain how the roots of the characteristic equation affect the stability of the system. (8)

(b) Draw the complete Nyquist plot for the system with $G(s)\ H(s)=\frac{k}{s(s+1)(s+5)}$ and discuss stability. (12)

VII. (a) Explain a phase lead compensator. (5)

(b) Sketch the root locus for the unity feed back system whose open loop transfer function is given by $G(s)=\frac{k}{s(s+2)(s+4)}$. (15)

OR

VIII. Design a P.I. controller so that a unity feed back control system having open loop transfer function $G(s).H(s)=\frac{k}{(s+1)(s+2)}$ will have a phase margin of 50^0 at frequency of 1.7 rad/s. (20)

IX. (a) Obtain the state transition matrix $\phi(t)$ of the following system. (10)

$$\begin{bmatrix} \cdot \\ x_1 \\ \cdot \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & -3 \\ -2 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

(b) Write the state space equation of a series RLC circuit. (10)

OR

X. Write notes on:

(i) Magnetic amplifier
(ii) A.C.Servomotor
(iii) Principle of Adaptive control system
(iv) Rotating amplifiers. (20)

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