B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017

CONTROL SYSTEMS

(Electronics & Computer Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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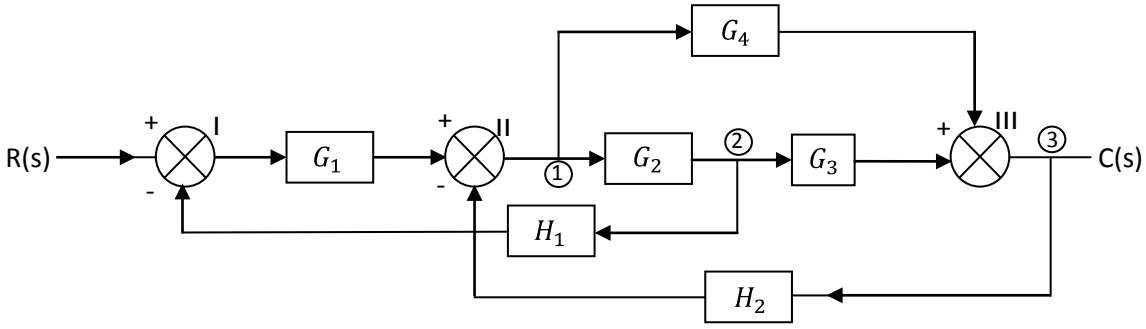
1 (a) Write the merits and demerits of open loop and closed loop systems.

(b) What are the characteristics of feedback? Explain

2 Determine the overall gain C/R for the block diagram shown below using signal flow graph approach.



3 (a) Discuss the effect of PD and PI on performance of a control system.

(b) The open loop transfer function of a unity feedback control system is: G(S) =100/S(1+0.1S). Determine the steady state error of the system when the input r(t) = (2+5t) u(t).

4 (a) Plot the root locus pattern of a system whose forward path transfer function is:
$G(S) = (S+40)/\ S(S+20)(S^2+60S+100^2)$.

(b) A negative feedback control system has open loop transfer function $G(S) = \frac{K(S+6)}{s^3+as^2+2s+1}$ using RH criterion, determine the value of K as the system oscillates at a frequency of 2 rad/sec.

5 Sketch the bode plots for the transfer function $G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$ and determine the following: (i) Gain cross over frequency. (ii) Phase cross over frequency. (iii) Gain margin. (iv) Phase margin.

6 (a) Differentiate between polar plot and nyquist plot.

(b) Draw the polar plot for $GH(s) = 100/(S^2\ (S+30))$.

7 Open loop transfer function of an unity feedback system is $(s) = \frac{500}{s(0.1s+1)}$. Design a suitable compensator so that the system acquires a damping factor of 0.4 without loss of steady state stability.

8 Diagonalize the state model given by;

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -3 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u(t)$$

$$y(t) = [1 \quad 1 \quad 0]\,x(t)$$

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