TE-sem-V-012-EXTC-PCS 2/6/16

QP Code : 29336

OLD CORSE

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory.**
(2) In total solve **five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable **data** if **necessary.**

1. (a) What is the effect of feedback in open loop system ? 4
   (b) Derive the transfer function of the network shown in fig. 1. 4

Figure 1

   (c) Find the rise time of unity feedback system with open loop transfer function G(s) for step input of 10 units. 4

$$G(s)=\frac{10}{s(s+1)}$$

   (d) What is the effect of PD controller on second order system ? 4
   (e) State Nyquist theorem. 4

2. (a) Consider unity feedback system with forward transfer function $G(s) = K(2s+1)/s(5s+1)(1+s)^2$ for input $r(t) = 10+5t$, find the minimum value of K so that steady state error is 0.1. 10
   (b) Discuss response of second order system for step input. 10

3. (a) Derive the transfer function for the mechanical system shown in fig. 2 10

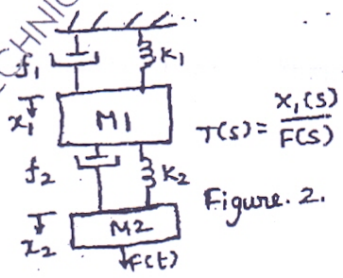

Figure. 2.

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(b) For the block diagram shown in figure 3, find the transfer function using block diagram reduction technique. 10

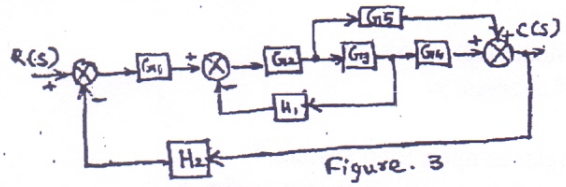
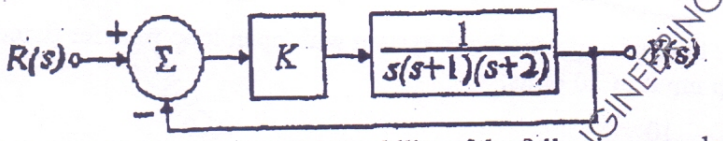


Figure. 3

4. (a) Sketch the root locus of the following system. Determine the value of K such that the damping ratio ζ of a pair of dominant complex conjugate closed-loop is 0.5. 10



(b) Draw the Nyquist plot and find the stability of the following open loop transfer function of unity feedback control system. 10

$G(s)\ H(s) = K\ (s+2)\ /\ s^2(s+1)$

If the system is conditionally stable, find the range of K for which the system is stable.

5. (a) A open loop transfer function of the system $G(s) = 10000/s(1+0.1s^2)$. Find the following parameters. 10

(i) Gain margin and phase margin
(ii) Magnitude at an angular frequency of $\omega = 20$ rad/sec
(iii) Stability of system with its bode plot.

(b) Briefly explain about lead-lag compensators. 10

6. (a) Define the following frequency response specifications 10

(i) Resonance Peak
(ii) Bandwidth
(iii) Cut off frequency
(iv) Gain margin

(b) Explain ON-OFF control action with example. 10

7. Write short notes on any two. 20

(a) Stepper Motor
(b) Synchros
(c) Mason's Gain Formula