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TE-sem-VI - CBGS - Electrical - C.S-I

26/5/16

Q. P. Code : 584802

3 Hours **Total Marks - 80**

N.B.:- (1) Question no **ONE** is compulsory.
(2) **Attempt** any **THREE** questions out of remaining questions.
(3) Assume suitable data if necessary and justify the same.
(4) Use graph paper and semilog paper wherever necessary.

Q 1. Answer any **FOUR** from the following questions.

a. Functionally, how do closed-loop systems differ from open-loop systems? **5**

b. Find the transfer function, X(s) / F(s), for the system of Figure 1. **5**

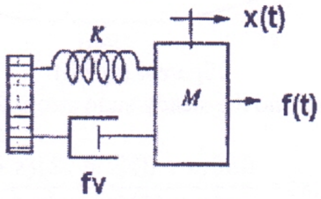

Figure 1 (Q.1 b)

c. Briefly state and explain the Nyquist criterion. **5**

d. How to convert a system represented in state space to transfer function. **5**

e. How to determine steady state error characteristics from Bode plot? **5**

Q 2 a) Find the transfer function, $G(s) = V_L(s)/V(s)$, for the circuit given in Figure 2. **10**

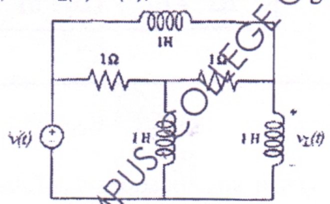

Figure 2 (Q.2 a)

Q 2 b) Reduce the block diagram shown in Figure 3 to a single block representing the transfer function T(s) =C(s)/R{s). **10**

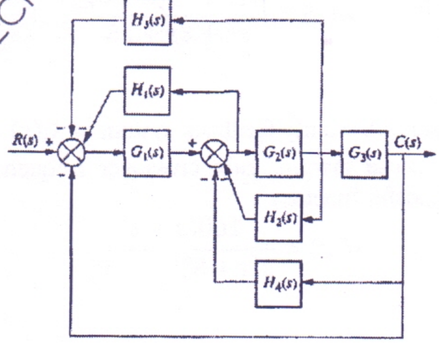

Figure 3 (Q.2 b)

[Turnover

Q 3 a) Draw a signal-flow graph for the state space following state equation **10**

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -3 & 1 \\ -3 & -4 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} r \; ; y = \begin{bmatrix} 1 & 2 & 0 \end{bmatrix} x$$

Q 3 b) Using Mason's rule, find the transfer function, $T(s) = C(s)/R(s)$, for the system represented by Figure 4. **10**

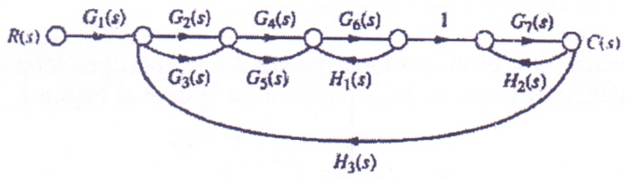

Figure 4 (Q.3 b)

Q 4 a) For the unity feedback system find the steady-state errors for the following test inputs: 25u(t), 31t u(t), 47 t^2 u(t). **10**

$$G(s) = \frac{450(s+8)(s+12)(s+15)}{s(s+38)(s^2+2s+28)}$$

Q 4 b) Find the number of poles in the left half-plane, the right half-plane, and on the jω axis for the system of Figure 5. Comment on stability. **10**

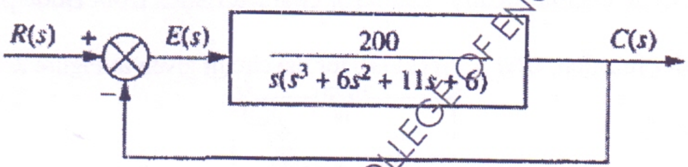

Figure 5 (Q.4 b)

Q 5 a) For each pair of second-order system specifications that follow, find the location of the second-order pair of poles. **10**

a. %OS = 12%; Ts = 0.6 second
b. %OS = 10%; Tp = 5 seconds

Q 5 b) Sketch the root locus for the unity feedback system for the transfer function given below **10**

$$G(s) = \frac{K(s+2)(s+6)}{s^2+8s+25}$$

Q 6 a) Sketch the Nyquist diagram of the unity feedback system of $G(s) = \frac{(s+2)}{s^2}$ **10**

Q 6 b) Determine gain margin, phase margin, gain crossover frequency and phase crossover frequency for following transfer function **10**

$$G(s) = \frac{100(s+2)}{s(s+5)(s+10)}$$