Code No. 6091 / S

FACULTY OF ENGINEERING

B.E. 3/4 (EE/Inst.) I - Semester (Suppl.) Examination, July 2014

Subject : Linear Control Systems

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

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Write the analogous electrical and mechanical quantities based on Force-Current analogy. (3)

2 Write down the mathematical equation for the system shown below. (2)

3 Find the steady state error for unit ramp for the following system. (2)

$$\frac{10}{s(0.1s+1)(0.5s+1)}$$

4 Prove that the (n – m) roots of the characteristic equation go to infinity as K $\rightarrow \infty$ along asymptotes making angles, $\phi = \frac{(2k-1)180^o}{n-m}$; k = 0, 1, 2, ….. (n – m – 1). (3)

5 Correlate Time Response and Frequency Response. (2)

6 Explain about phase lead compensation. (3)

7 Prove $[\Phi_{(t)}]^k = \Phi_{(kt)}$ (2)

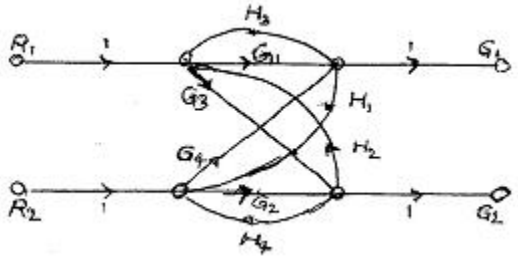
8 What is meant by observability? State the necessary and sufficient condition for the system to be completely observable. (3)

9 Write transfer function of zero order hold, first order hold and exponential hold circuits. (3)

10 State Shanon's sampling theorem. (2)

PART – B (50 Marks)

11 (a) Find the C/R for the following system using mason's gain rule. (7)



(b) Compare open loop system and closed loop system. (3)

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12 Sketch the root locus of the system

$$G(s)H(s) = \frac{K}{s(s+1)(s+6)}$$

If a zero at s = -2 is added to the system sketch the root locus and comment on the effect of adding a zero. What happens to the breakaway point. Compare the values of K for which the original system and the modified system are stable. (10)

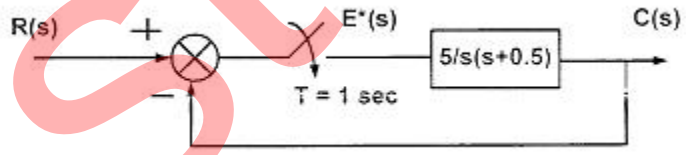
13 Obtain magnitude and phase angle Bode plots for the system. (10)

$$G(s) = \frac{20(0.1s+1)}{s^2(0.2s+1)(0.02s+1)}$$

14 Obtain the normal form of state model for the system whose transfer function is given by (10)

$$T(s) = \frac{Y(s)}{U(s)} = \frac{s+1}{s(s+2)(s+4)}$$

15 Determine the pulse transfer function and stability of the sampled data control system shown in below figure for sampling time (a) T=0.5 sec and (b) T=1 sec. (10)



16 Draw the complete Nyquist plot for a system with $G(s)H(s) = \frac{1+4s}{s^2(1+s)(1+2s)}$ and also check the stability of the system. (10)

17 For the state mode $\dot{x}(t) = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} x(t)$ obtain the Eigen values and vectors, and response when $x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $x(0) = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

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