Exam.Code:0935
Sub. Code: 6985

1129

B.E. (Electrical and Electronics Engineering)
Fifth Semester
EE-509: Control Engineering – II

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

1. (i) What do you mean by state space analysis?
(ii) Prove the identity:
$$\phi(t_2 - t_1).\ \phi(t_1 - t_0) = \phi(t_2 - t_0)$$
(iii) Write the statement of Caley Hamilton theorem.
(iv) Differentiate between feedforward and feedback.
(v) Write selection parameters for compensators. (5 x 2)

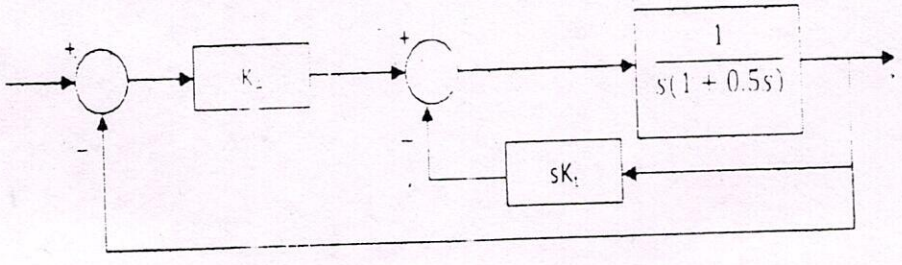
Part A

2. (i) Consider a system with state model:
$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u \quad : \quad x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$
Compute state transition matrix. (5)

(ii) Test the following system for Observability:
$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$ (5)

3. Design a phase lag compensator using bode plot and root locus. Compare the two designs. (10)

4. Block diagram model of a position control system is as shown:



P.T.O.

(i) In the absence of derivative feedback ($K_t = 0$), determine the damping ratio of the sy for amplifier gain $K_A = 5$. Also find e_{ss} for unit ramp input.

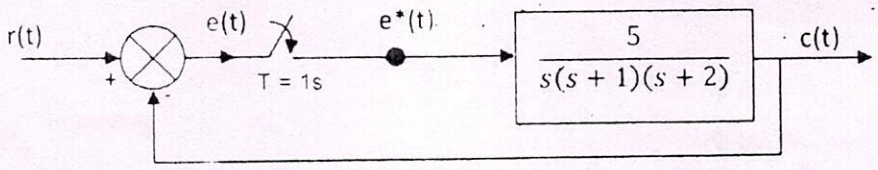
(ii) Find suitable values of parameters K_A and K_t so that the damping ratio is increased t without affecting steady state error as obtained in part (i).

Part B

5. (i) Explain sampling process with suitable waveforms.

(ii) Find z-transform of $f(t) = u(t) - e^{-t}$

6. For the following system, determine characteristic equation in z-domain and ascertain its sta via bilinear transformation.



7. (i) Explain digital temperature control system with the help of block diagram.

(ii) Discuss the application of Programmable Logic Control on digital control systems.

x-x-x