Total No. of Questions : 6]

SEAT No. :

P5486

[Total No. of Pages : 2

BE/Insem./Oct.-58
B.E. (Electrical) (Semester - I)
CONTROL SYSTEM - II
(2012 Pattern)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Design a phase Lag compensator for a system whose open transfer function is **[8]**

$$G(s) = \frac{5}{s(1+0.1s)(1+0.3s)}$$

So that its phase margin will be 50°.

b) Draw electrical network for lead compensator; as well as Lag compensator. **[2]**

OR

Q2) a) Compare characteristics of all three types of compensators. **[6]**

b) Derive transfer function of Lag-Lead compensator. **[4]**

Q3) a) Obtain Canonical state model for **[6]**

$$T(s) = \frac{s+5}{(s+1)(s+2)(s+3)}.$$

b) Derive an expression of Transfer function from its state model. **[4]**

OR

P.T.O.

Q4) a) Find State Transition Matrix (STM) for the system **[6]**

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$

b) Show that solution of Non-homogeneous state equation consists of Zero Input Response (ZIR) & Zero State Response (ZSR). **[4]**

Q5) a) Find state feedback gain matrix K for the given system to place poles at desire location of –3, –4 and –5. **[6]**

$$\dot{X}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 5 \end{bmatrix} u(t)$$

$Y(t) = [100]\, x(t).$

b) Explain effect of pole zero cancellation on controllability & observability of the system. **[4]**

OR

Q6) a) Explain various methods of evaluation of state observer gain matrix K_e. **[6]**

b) For a given system determine observer gain matrix for desired poles at S = –5 and S = –5. **[4]**

$\dot{X} = Ax + Bu \qquad Y = Cx$

Where $A = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix}; C = \begin{bmatrix} 1 & 0 \end{bmatrix}.$

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