Total No. of Questions : 6]

SEAT No. :

P4912

[Total No. of Pages : 2

B.E./Insem - 29
B.E. (Electrical)
Control System - II
(Semester - I)

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

Instructions to the candidates:-

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Unit - I

Q1) The system $G(s) = \dfrac{K}{s(s+4)}$ is to be compensated for Kv = 10/sec & damping factor $\xi \geq 0.37$. Design a suitable lag compensator. **[10]**

OR

Q2) Forward path transfer function of a unity feedback system is, **[10]**

$$G(s) = \frac{10}{s(1+0.2s)}$$

Design a lead compensator to satisfy following specifications :

a) Kv = 100 /sec

b) Phase Margin >=50

Unit - II

Q3) a) Prove that $G(s) = C(sI - A)^{-1}B + D$ **[4]**

b) Obtain Phase Variable form of state model for the following transfer function. **[6]**

$$G(s) = \frac{s+6}{s^2+9s+20}$$

OR

Q4) a) Obtain Eigen values, Eigen vector for the system matrix. **[4]**

$$A = \begin{bmatrix} 1 & 0 \\ -3 & -4 \end{bmatrix}$$

b) Obtain the diagonalized state model for the system. **[6]**

$$\dot{x} = \begin{bmatrix} -6 & 1 \\ -5 & 0 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u;$$

$$y = \begin{bmatrix} 1 & -2 \end{bmatrix} x$$

Unit - III

Q5) a) Check controllability and observability of the following system. **[4]**

$$\dot{x} = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 1 \end{bmatrix} x$$

b) What is state observer? What is the need for state observer? **[6]**

OR

Q6) a) Explain Kalman's test of controllability and observability. **[4]**

b) A system is represented in state variable form, **[6]**

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

Design a state feedback gain vector k to shift system pole position to a new position of poles s = – 4, – 5.

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