Total No. of Questions : 8]

SEAT No. :

P625

[Total No. of Pages : 2

[5869]-247
S.E. (Electronics & Telecommunication)
CONTROL SYSTEM
(2019 Pattern) (Semester - IV)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve question Q.1 or Q.2, Q.3 or Q.4, Q.5or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume the suitable data, if necessary.***

Q1) a) The characteristics equation of closed loop system is given as $1 + G(s)\,H(s) = s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16$. Check the stability of system and determine number of closed loop pole lies in RHP of s plane. **[8]**

b) A unity feedback system with open loop transfer function $G(s) = \frac{k}{(s+1)^4}$.

Plot root locus. **[10]**

OR

Q2) a) The Characteristics equation of closed loop system is given as $1 + G(s)\,H(s) = s^3 + 7s^2 + 25s + 39 = 0$. Determine the number of roots which are lying on left half side of $\sigma = -1$. **[8]**

b) Plot a root locus for the system

$$G(s)\,H(s) = \frac{k}{s(s+4)(s^2+4s+13)} \quad 0 < k < \infty. \qquad \textbf{[10]}$$

Q3) a) Construct Nyquist plot and find Phase crossover frequency and gain margin if : $G(s)H(s) = \frac{1}{s(s+1)(s+2)}$. Also Comment on Stability. **[9]**

b) State the Limitations of frequency domain approach. **[8]**

OR

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Q4) a) Draw Bode plot of the system with open loop transfer function: $G(s) = \frac{20(s+5)}{s(s+10)}$ and determine gain margin, Phase margin. Also comment on Stability. **[9]**

b) State and explain the various frequency domain specifications. **[8]**

Q5) a) Obtain the controllable and Observable canonical state models for the system with transfer function $G(s) = s+3 / s^2+3s+2$ **[9]**

b) Define the terms **[9]**

i) State

ii) State Variables

iii) State Vector

iv) State Space

OR

Q6) a) Find transfer function of $= \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 5 \end{bmatrix} r(t); \; y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$. **[9]**

b) Determine the State transition matrix of state equation $X = \begin{bmatrix} 0 & 1 \\ -8 & -9 \end{bmatrix}$ x(t). **[9]**

Q7) a) State the characteristics of P, I, and D controllers. **[9]**

b) What do you understand by Integral Reset in PID controller? Explain with suitable example. **[8]**

OR

Q8) a) Describe the Ziegler-Nichols method of process-control loop tuning. **[9]**

b) In an application of the Ziegler-Nichols method, a process begins oscillation with a 30% proportional band in an 11.5 min period. Find the nominal three mode controller settings. **[8]**

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