

Total No. of Questions : 8]

SEAT No. :

PB-3617

[Total No. of Pages : 2

[6261]-22

S.E.(Electronics & Telecommunication)
CONTROL SYSTEMS
(2019 Pattern) (Semester - IV) (204192)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Using Routh's & Hurwitz's criteria, comment on the stability if characteristic equation is: $S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2$. [8]

b) Sketch root locus of the unity feedback system with open loop transfer

function $G(s) = \frac{K}{s(s+1)(s+4)}$ [10]

OR

Q2) a) A feedback control system has open loop gain

$G(s)H(s) = \frac{k(s+2)}{s(s+1)(s^2+2s+5)}$. Determine the value of 'k' for which the system is stable as well as critically stable. [8]

b) A unity feedback system has the loop transfer function,

$G(s) = \frac{k}{s(s+1)(s+3)(s+4)}$ Determine: Breakaway points, intersection with imaginary axis. Plot root locus. [10]

Q3) a) For an unity feedback system with open loop transfer function

$G(s) = \frac{4}{s(s+2)}$. Determine Damping factor, Undamped natural frequency, resonant peak, and resonant frequency. [9]

b) The open loop transfer function of a unity feedback system is given by

$G(s) = \frac{1}{s(s+1)(s+2)}$ Sketch the polar plot and determine the gain margin.

Also comment on the stability. [9]

P.T.O

OR

Q4) a) The open loop transfer function of the system $G(s)H(s) = \frac{10}{(s+2)(s+4)}$

Determine the system stability using Nyquist plot. [9]

b) For the unity feedback system with open loop transfer function

$G(s) = \frac{12}{s(s+2)(s+6)}$ sketch the bode plot. Determine gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also investigate the stability. [9]

Q5) a) Obtain the expression for state transition matrix and state any four properties of state transition matrix. [9]

b) Find Controllability and Observability of the system given by state model. [9]

$$A = \begin{bmatrix} 1 & 1 & 5 \\ 1 & -2 & 2 \\ 5 & 2 & -8 \end{bmatrix}, B = \begin{bmatrix} 5 \\ 1 \\ 10 \end{bmatrix}, C = [10 \ 15 \ 11], D = [0]$$

OR

Q6) a) Obtain the state model for the system with transfer function $\frac{Y(s)}{U(s)} = \frac{3S+4}{S^2+5S+6}$. [9]

b) Determine the transition matrix of state equation $\dot{X} = \begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix} x(t)$. [9]

Q7) a) Explain Proportional mode, Integral Mode and Derivative Mode. [8]

b) What do you mean by Industrial Automation? What are its types? Explain the architecture of an automation. [8]

OR

Q8) a) Explain the Ziegler–Nichols tuning method of a PID controller. [8]

b) Explain what do you mean by Offset in controller. Which method is used to eliminate this problem? [8]

