

Total No. of Questions : 8]

SEAT No. :

PC-1752

[Total No. of Pages : 2

[6353]-70

T.E. (Electrical Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - II) (303150)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Explain Routh-Hurwitz criteria for stability analysis along with special cases. [8]

b) By applying Routh's criteria, determine stability of a system with characteristic equation given by [9]

$$1 + G(S)H(S) = S^4 + 2S^3 + 6S^2 + 4S + 1 = 0$$

OR

Q2) a) Explain related to root locus : [4]

- i) Centroid
- ii) Breakaway point

b) Sketch complete root locus for following system and comment on stability. [13]

$$G(S)H(S) = \frac{K(S^2 + 2S + 2)}{S(S+4)}$$

Q3) a) State various steps to determine stability using polar plot. [4]

b) Sketch the polar plot for following system clearly indicating intersection with negative real axis. Comment on system stability. [13]

$$G(S)H(S) = \frac{10}{S^3 + 4S^2 + 6S + 8}$$

OR

P.T.O.

- Q4) a)** Describe co-relation between time and frequency domain. [7]
- b)** Sketch Nyquist plot for the following system and comment on system stability. [10]

$$G(S)H(S) = \frac{90}{(S+3)(S+6)}$$

- Q5) a)** Explain various steps to sketch magnitude and phase plot in Bode plot. [6]
- b)** Draw Bode plot for following unity feedback system. Determine gain margin, phase margin, gain cross-over frequency and phase cross-over frequency. [12]

$$G(S)H(S) = \frac{800(S+2)}{S^2(S+10)(S+40)}$$

OR

- Q6) a)** Draw Bode plot for the unity feedback system with following equation: [10]

$$G(S)H(S) = \frac{40}{S(S+2)(S+20)}$$

- b)** State and explain gain cross over frequency, phase cross over frequency, gain margin and phase margin and how to determine stability from them. [8]

- Q7) a)** Define PID tuning. Explain Ziegler Nicholas method for designing PID controller. [9]
- b)** Explain Lag network using circuit diagram, pole-zero plot and Bode diagram. [9]

OR

- Q8) a)** Explain basic components of dc servo motor, draw block diagram and state its transfer function. [9]
- b)** Explain Lead network using circuit diagram, pole-zero plot and Bode diagram. [9]

