

Total No. of Questions : 8]

SEAT No. :

PE5081

[6583]-63

[Total No. of Pages : 2

T.E. (Electrical)

**CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - VI) (303150)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Use of non programmable calculator is allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Define stability, conditions for stability. Explain Routh criterion for stability. [8]
- b) For a unity feedback system given sketch the root locus. Find breakaway point, K_{marginal} , frequency of sustained oscillations. [9]

$$G(s) = \frac{K(s+6)}{s(s+2)(s^2+6s+13)}$$

OR

- Q2)** a) Using Routh's Hurwitz Criterion for stability determine range of values of K for the system to be stable. Determine frequency of sustained oscillations from that. [9]

$$G(s) = \frac{K}{s(s+4)(s^2+s+1)}, H(s) = 1$$

- b) Explain any 4 rules of root locus. [8]
- Q3)** a) Explain co relation between frequency domain and time domain. [8]
- b) Explain polar plot. Draw polar plot for system with open loop transfer function as [9]

$$G(s) = \frac{20}{s(s+2)(s+3)}$$

OR

- Q4)** a) State and explain Nyquist Stability Criterion. [8]
- b) Draw the Nyquist plot of the given system $G(S)H(S)=5/[S(S+2)(S+4)]$ and comment on stability. [9]

P.T.O.

Q5) a) Draw magnitude and angle plot for following factors [6]

i) $1/j\omega$

ii) $1/(1+j\omega T)$

b) Sketch bode plot for system given by $G(s)H(s) = \frac{12(s+5)}{s(s+1)(s+3)}$ [12]

Find GM, PM, gain cross over frequency, phase cross over frequency.
Comment on stability of system.

OR

Q6) a) Find the Stability the following system by sketching the Bode plot. [12]

$$G(s) = \frac{40(s+2)}{s(s+4)}$$

b) State and explain GM, PM and how to determine stability from it. [6]

Q7) a) Explain PID controller with its characteristics and its effect on system performance. [9]

b) Explain lag and lead network with their transfer function. [9]

OR

Q8) a) Using Ziegler Nichols method design a PID controller for system with unity feedback and $G(s) = \frac{24}{s(s+3)(s+6)}$. [9]

b) Derive transfer function of DC servo motor. [9]

