Total No. of Questions : 8]

SEAT No. :

PD4273

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T.E. (Electrical Engineering)

CONTROL SYSTEM ENGINEERING

(2019 Pattern) (Semester - VI) (303150) (Term-II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or Q8.***
2) ***Use of electronic calculator is permitted.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain any four rules for construction of root locus. **[8]**

b) Sketch root locus for given OLTF $G(s)H(s)=\frac{K}{s(s+4)(s^2+2s+2)}$. Determine marginal value of K and comment on stability. **[10]**

OR

Q2) a) Explain Routh's Hurwitz criterion for stability. Explain special cases of Routh's criterion. **[8]**

b) 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 $G(s)=\frac{K}{s(s+4)(s^2+s+1)}, H(s)=1$. **[10]**

Q3) a) Explain correlation between frequency domain and time domain. **[7]**

b) Sketch Polar plot for the system given. Also determine GM and PM

$$G(s)=\frac{50}{s(s+3)(s+6)}.$$ **[10]**

OR

Q4) a) Explain Nyquist stability criterion, general nyquist contour for system with pole at origin. **[7]**

b) Sketch the nyquist plot, for given system and comment on stability

$$G(s)=\frac{10}{s(s+2)(s+3)}.$$ **[10]**

P.T.O.

Q5) a) Sketch bode diagram showing GM, PM for i) stable system ii) unstable system iii) marginally stable system. **[6]**

b) Draw bode plot for a unity feedback system with G(s) given as. Also find GM,PM and comment on stability of system $G(s) = \frac{160}{(s+2)(s+20)}$. **[12]**

OR

Q6) a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin in Bode plot. **[6]**

b) Draw bode plot for a unity feedback system with G(s) given as. Also find GM,PM and comment on stability of system $G(s) = \frac{20(s+5)}{s(s+10)}$. **[12]**

Q7) a) Derive transfer function of armature controlled DC servo motor. **[8]**

b) Using Ziegler Nicholas method design a PID controller for a system with unity feedback and $G(s) = \frac{1}{s(s+2)(s+5)}$. **[9]**

OR

Q8) a) Derive transfer function of Lead network, its pole zero plot and key features. **[8]**

b) Explain P, PI, PID controller with reference to their expression, block diagram, advantages and shortcomings. **[9]**