

[6402]-115

S.E. (Robotics & Automation Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - IV) (211509)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain Routh Hurwitz Stability Criteria. [9]

b) If $G = K/S (S+6) (S+8)$ and $H(S) = S+2$. Comment on stability. **[8]**

OR

Q2) a) What is stability? Explain stable, unstable, marginally and conditionally stable system with locations of roots in s plane. [9]

- b) i) The System with Characteristics Equation $Q(S) = S^3 + 2KS^2 + (K+2)S + 4 = 0$ find range of K for stability
- ii) Investigate the stability of system with Characteristics equation $Q(S) = S^5 + 5S^4 + 10S^3 + 10S^2 + 5S + 1 = 0$

[4+4=8]

Q3) a) Define phase margin and gain margin. Also draw a 40db/dec line passing through $w = 1$, 5 db till $w = 5$. [8]

b) What is frequency domain analysis? Explain any one stability criteria used in frequency domain to check the stability of system. **[9]**

OR

Q4) a) Draw the polar plot for $(S) = 1 + as$. [8]

b) Derive the expression for Resonant Frequency and Resonant Peak **[9]**

Q5) a) Define PLC? What are the necessity of PLC? Give advantages and disadvantages of PLC. [9]

b) State the sampling theorem explain the process of sampling and quantization with waveform. **[9]**

OR

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Q6) a) Explain digital control system in detail. Enlist its advantages and Applications. [9]

b) Explain the selection criteria used for PLC. [9]

Q7) a) Enlist phase lead design steps using bode diagram with effects, advantages, disadvantages of phase lead compensation. [9]

b) Explain the procedure to design of lag compensator using root locus. [9]

OR

Q8) a) Design a lead compensator for the system with open loop transfer function $G(S) = 9/S(S+3)$ to meet following specifications. [11]

i) Steady state error for ramp input be less than or equal to 0.05

ii) Phase margin of at least 45 degree.

b) Explain the Procedure to design of lead compensator using root locus. [7]
