Total No. of Questions : 8]

SEAT No. :

PA-1313

[Total No. of Pages : 2

[5925]-346
S.E. (Robotics & Automation Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - IV) (211509) (Theory)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
3) ***Assume suitable data, if necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Give Properties of Root Locus. **[8]**

b) Sketch root Locus of unity feedback system with open loop transfer function G(S) = K/S ((S+1)((S+4). **[9]**

OR

Q2) a) Explain Routh Hurwitz Stability Criteria. **[8]**

b) i) The system with Characteristics Equation

$Q(S) = S^3 + 2KS^2 + (K+2)S + 4 = 0$ find range of K for stability. **[5]**

ii) Investigate the stability of system with Characteristics equation

$Q(S) = S^5 + 5S^4 + 10S^3 + 10S^2 + 5S + 1 = 0$ **[4]**

Q3) a) Sketch Polar Plot with Open loop transfer function.

i) $G(S)H(S)=1 - 2S/S(1 + 2S)$ **[4]**

ii) $G(S)H(S) = 1+ 2S/(S + 1) (1 – 2S)$ **[4]**

b) Draw a typical frequency response of system and explain different frequency response specifications. **[9]**

OR

Q4) a) Derive the expression for Resonant Frequency and Resonant Peak. **[8]**

b) For the system with open loop transfer functionG(S)H(S)=5/S(S+2) Sketch Nyquist plot and investigate stability. **[9]**

P.T.O.

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

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

OR

Q6) a) Explain PLC interfacing with I/O devices? What are the different types of command used in PLC. **[9]**

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

Q7) a) Explain the procedure to design lead compensator using Bode diagram. **[8]**

b) Design a lead compensator for system with transfer function G(S)=25/S(S+6) to meet following specifications. **[10]**

i) $m_p = 5\%$

ii) $t_s = 0.75$ sec

OR

Q8) a) Explain the procedure to design of lead compensator using root locus. **[6]**

b) Design lead compensator for the system with open loop transfer fucntion $G(S) = \frac{20}{S(S+5)}$ to meet followin specification. **[12]**

i) Steady state error for ramp input to be less than or equal to 0.025.

ii) Phase Margin of at least 45°

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