Total No. of Questions : 8]

SEAT No. : ____

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S.E. (Robotics & Automation Engineering)

CONTROL SYSTEM ENGINEERING

(2019 Pattern) (Semester - IV)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***All question are compulsory i.e. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q.8.***
2) ***Assume suitable data if necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Find the range of K for stability unity feedback system with characteristic Equation. **[9]**

$G(S) = K/S\ (S+2)\ (S+4)\ (S+6)$

Also define :

i) Pole

ii) Zero

iii) S-plane

b) Explain Routh's array with stability criteria, state advantages and disadvantages of Routh's criteria. **[9]**

OR

Q2) a) Draw root locus for the system $G(S)\ H(S) = K/S\ (S+3)\ (S+6)$, obtain the value of K When $\varsigma = 0.6$ from root locus. **[9]**

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

Q3) a) Define frequency response of a system & explain **[8]**

i) Frequency Domain Analysis

ii) Nyquist Stability Criteria

b) Find the stability of following system using Nyquist plot. **[9]**

$G\ H(S) = 1 / s^3\ (s+1)$

OR

P.T.O.

Q4) a) Define phase margin and gain margin. Explain lead lag compensating network. **[8]**

b) What are polar plots? Draw the polar plot for G (s) = 1 + as. **[9]**

Q5) a) Explain digital control system with block diagram. Enlist its advantages and disadvantages. **[8]**

b) Explain the architecture of PLC with neat diagram. **[9]**

OR

Q6) a) Explain input and output field devices used in PLC (any 8). **[8]**

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

Q7) a) Enlist phase lead design steps using bode diagram. **[8]**

b) Design lead compensator for the system with OLTF, G(s) = 9/s (s+3) to meet following Specifications. **[10]**

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

ii) Phase margin of at least 45 degree.

OR

Q8) a) What is compensator? Write the design steps of lead compensator using root locus approach. **[8]**

b) Design the lead compensator for a system with transfer function G(s) = 2s/s (s+6) to meet following specifications **[10]**

i) Mp = 5%

ii) T_s = 0.75 sec.

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