Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2019

Subject Name: Control System Engineering

Subject Code: 4TE04CSE1   **Branch: B.Tech (EC)**

Semester : 4   **Date : 17/09/2019**   **Time : 02:30 To 05:30**   **Marks : 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1   **Define the following terms:**   **(14)**
  a) Source node
  b) Sink node
  c) Chain node
  d) Forward path
  e) Feedback path

  f) Self-loop
  g) Non-touching loops
  h) Gain margin
  i) Phase margin
  j) Bandwidth
  k) Resonant frequency
  l) Resonant peak
  m) Gain cross over frequency
  n) Proportional control

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**   **(14)**
  (a) What is control system? Mention the difference between the open loop and close loop control system.
  (b) Explain transfer function and write its advantages and dis advantages
Q-3   **Attempt all questions**   **(14)**
  (a) State and explain Nyquist stability criteria
  (b) Explain Type 0, Type 1 and Type 2 control system. Derive equation for the steady state error of the Type 2 control system for step, ramp and parabolic input.
Q-4   **Attempt all questions**   **(14)**
  (a) Draw a schematic diagram of armature controlled DC motor and its block diagram with closed loop. Derive the transfer function for armature controlled DC motor.
  (b) The close loop transfer function of a given second order system is $100/(S^2$

+10S+100).Determine damping ratio, natural frequency, delay time, rise time, settling time and peak over shoot.

Q-5   **Attempt all questions**   **(14)**
(a) $S^6+4S^5+3S^4-16S^2-64S-48=0$ Check the stability of the given characteristic equation using Routh method.
(b)   Derive an expression for the time response of a second-order controlsystem subjected to a unit step input.

Q-6   **Attempt all questions**   **(14)**
(a)   Explain the procedure to design Lag Compensator using Root Locus.
(b)   Write short notes on correlation between the time and frequency response?

Q-7   **Attempt all questions**   **(14)**
(a)   Explain bode plot of Lag-Lead compensator.
(b)   Write a brief note on polar plots with a sketch of a simple example.

Q-8   **Attempt all questions**   **(14)**
(a)   Write short note on PID controller.
(b)   Explain any three properties of Laplace transform.