Seat No.	

SL - 776

Total No. of Pages : 3

T.E. (E & TC) (Part - III) (Semester - V) (Revised) Examination, May - 2017

CONTROL SYSTEMS

Sub. Code : 66315

Day and Date : Tuesday, 16 - 05 - 2017 **Total Marks : 100**

Time : 10.00 a.m. to 01.00 p.m.

Instructions : 1) **All questions are compulsory.**

2) **Use suitable data wherever necessary.**

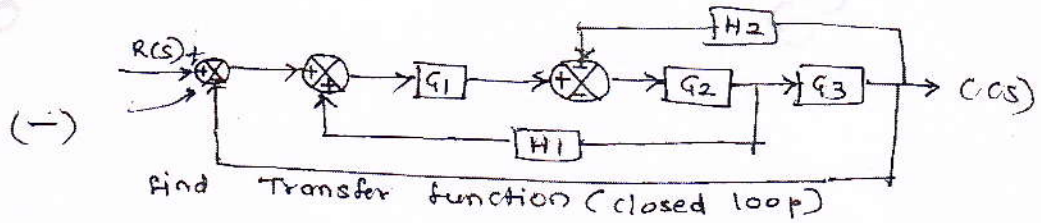
SECTION - I

Q1) Solve any TWO : **[2 × 9 = 18]**

a) Write mathematical model of mass, spring an damper element.

b) Derive transfer function of DC servo moter.

c)



Q2) Solve any TWO : **[2 × 8 = 16]**

a) Derive relation for impulse response of unit step and ramp for first order system.

b) Explain effect of on second order system performance

c) For the system with $\frac{C(S)}{R(S)} = \frac{16}{S^2 + 1.6S + 16}$

P.T.O.

Find :

i) rise time

ii) peaktime

iii) settling time

iv) Peak overshoot (MP) %

Q3) Solve any two : **[2 × 8 = 16]**

a) State and Explain Hurwitz and Routh criteria

b) Determine stability for $5^6 + 25^5 + 85^4 + 125^3 + 205^2 + 165 + 16$.

c) $$\frac{C(S)}{R(S)} = \frac{K}{S^4 + 65^3 + 305^2 + 605 + K}$$

Determine range of 'K' for system to be stable

SECTION - II

Q4) Solve Any Two : **[2 × 9 = 18]**

a) Explain the frequency domain specifications in Bode plot.

b) Sketch Bode plot and determine gain crossover and phase crossover frequencies.

$$G(s) = \frac{10(s+20)}{(s+10)(s+1)(s+2)}$$

c) Describe Nyquist stability criterion.

Q5) Solve Any Two : **[2 × 8 = 16]**

a) Derive state equations from transfer function of Linear discrete time systems.

b) Obtain the state model in Jordan's canonical form of system having transfer function

$$\frac{Y(s)}{U(s)} = \frac{2s^2 + 6s + 7}{s^3 + 5s^2 + 8s + 4}$$

c) Derive state model of Linear systems.

Q6) Solve any two : **[2 × 8 = 16]**

a) Explain the design procedure for a lead compensator.

b) Write note on PID controllers.

c) Derine polar plot and sketch polar plot for unity feedback system with open loop transfer function $G(s)H(s)=\frac{1}{s(s+2)}$