Total No. of Questions : 8]

SEAT No. :

P3611

[Total No. of Pages : 3

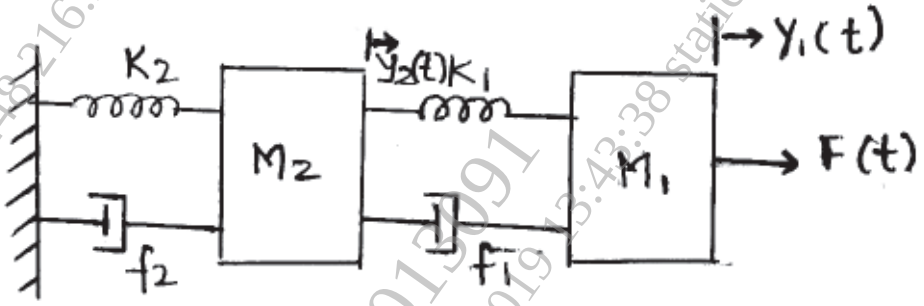
[5560]-566
T.E.(Electrical)
CONTROL SYSTEM - I
(2015 Course) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

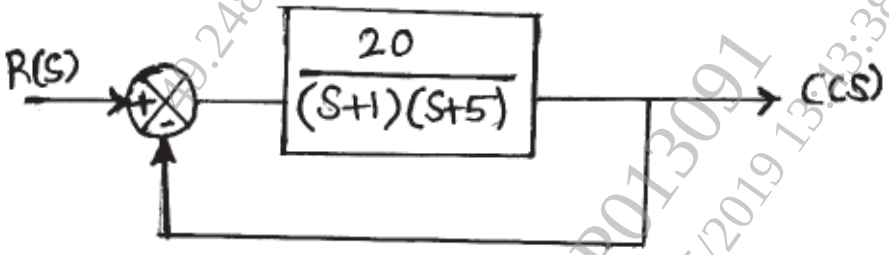
1) ***Answer any one question from each pair of questions : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Draw the electrical analogous network and write the equation **[7]**



b) The poles of a real rational transfer function are given as 0, –1 and – 4. There is a single zero (of order 2) at S = (–3). Determine the transfer function and plot pole zero on S-plane. **[5]**

c) The block diagram of a unity feedback control system shown in figure below. **[8]**



Determine the characteristic equation of the system ω_n, ξ, ω_d, t_p, M_p the time at which the first overshoot occurs, the time period of oscillation.

OR

P.T.O.

Q2) a) Define the following: **[7]**

i) Time response

ii) Transient response

iii) Steady state response

iv) Delay time

v) Rise time

vi) Peak time

vii) Settling time

b) A characteristic equation of a feedback control system is given by $s^5 + s^4 + 4s^3 + 4s^2 + 2s + 1 = 0$ comment on stability. **[4]**

c) A unity feedback control system has an open loop transfer **[9]**

$G(s) = \frac{K}{s(s^2 + 4s + 13)}$ Sketch the root locus of the system by determining the following

i) centroid and angle of asymptotes

ii) Angle of departure from the poles

iii) The value of K and the frequency at which the root locus crosses the imaginary axis.

Q3) a) Define and write formula **[8]**

i) Resonant frequency

ii) Resonant Peak

iii) Band width

iv) Plot M_r, M_p versus ξ for a second order system

b) A unity feedback system has open loop transfer function

$G(s) = \frac{(s+2)}{(s+1)(s-1)}$ using nyquist criterion determine whether the closed loop system is stable or not. **[8]**

OR

Q4) a) Briefly state the nyquist criterion. **[6]**

b) Sketch the bode plot for the system whose open loop transfer function is given by $G(s) = \frac{20(0.1s+1)}{s(0.5s+1)(0.3s+1)}$ and find GM, PM, ω_{gc}, ω_{pc}. **[10]**

Q5) a) Define Gain margin, phase margin, phase crossover frequency, gain crossover frequency. **[6]**

b) Sketch the asymptotic plot for open loop transfer function given by $G(s) = \frac{2(s+0.25)}{s^2(s+1)(s+0.5)}$ from bode diagram determine GM, PM, ω_{gc}, ω_{pc}. **[12]**

OR

Q6) a) Sketch bode diagram showing gain margin and phase margin for **[6]**

i) Stable system

ii) Unstable system

b) Using nyquist criterion investigate the stability of a closed loop control system whose open loop transfer function is given by **[12]**

$$G(s) = \frac{K}{s(sT1+1)(sT2+1)}$$

Q7) a) Write short note on **[8]**

i) Lead compensator

ii) AC Tachometer

b) Explain the features of the following **[8]**

i) P-Controller

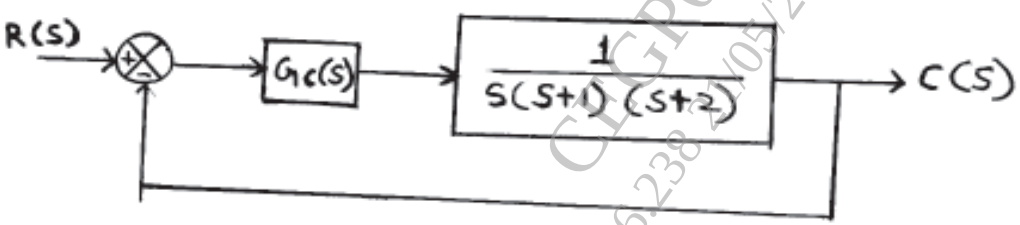
ii) PI-Controller

iii) PID-Controller

OR

Q8) a) Write short notes on synchros. **[6]**

b) For the system shown below, design PID controller using Zigler Nichol tuning rule **[10]**



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