Total No. of Questions : 12]

SEAT No. :

P4156

[Total No. of Pages : 4

[5460]-16

T.E. (Electronics & Telecommunication Engg.)

CONTROL SYSTEMS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer three questions from Section - I and three questions from Section -II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data, if necessary.***
6) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain the block diagram reduction rules. **[8]**

b) Determine the transfer function Y(s)/R(s) of the system shown in figure No.1 **[8]**

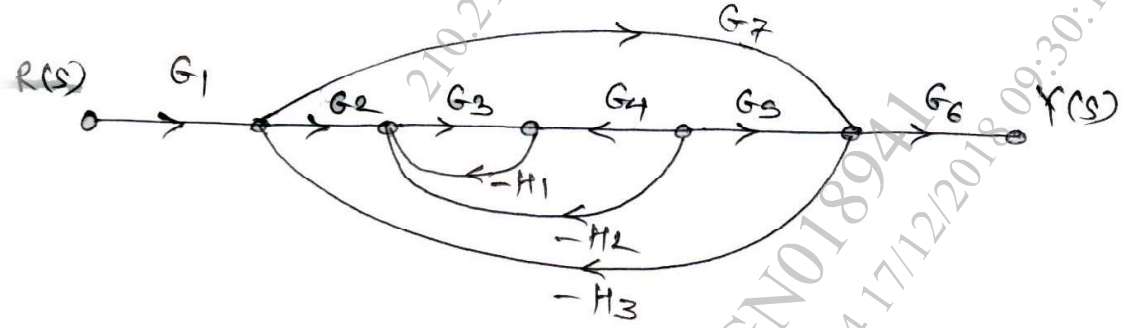

Figure No. - 1

OR

Q2) a) Obtain force to voltage and force to current analogies between mechanical and electrical systems. **[8]**

P.T.O.

b) Determine the transfer function Y(s)/R(s) of the system shown in figure No. 2. **[8]**

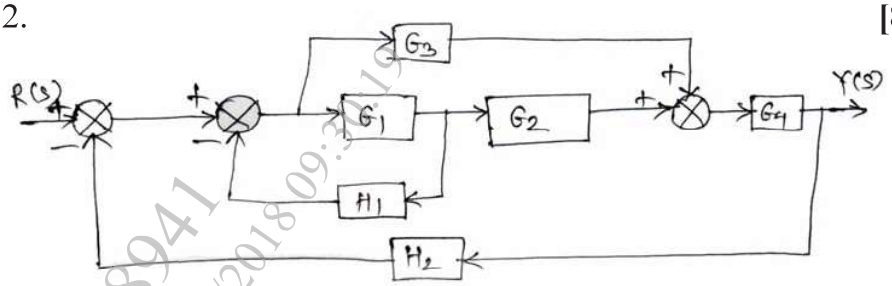

Figure No. - 2

Q3) a) For the system with closed loop transfer function $G(s) = \frac{25}{s^2 + 8s + 25}$ determine ζ, w_n, w_d, t_d, t_r, t_p, m_p, and t_s. **[8]**

b) For the system with open loop transfer function

$G(s) = \frac{k}{s(s+4)(s^2+6s+10)}$, determine range of k for stability, value of k at marginal stability and frequency of oscillations at marginal stability. **[8]**

OR

Q4) a) For the system with $G(s) = \frac{50}{s(s+4)(s+6)(s+10)}$, H(S) = 1 determine static error constants and steady state error for ramp input. **[4]**

b) Sketch root locus of system with open loop transfer function $G(s) = \frac{k}{s(s+4)(s+6)}$. **[12]**

Q5) a) Explain the correlation between time and frequency domain specifications. **[6]**

b) Sketch Bode plot of unity feedback system with open loop transfer function $G(s) = \frac{100}{s(s+2)(s+5)}$. Determine w_{gc}, w_{pc}, gain margin, phase margin and investigate the stability. **[12]**

OR

Q6) a) Explain Nyquist stability theorem. **[6]**

b) Sketch Nyquist plot of unity feedback system with open loop transfer function $G(s) = \dfrac{20}{(s+1)(s+2)(s+5)}$.

Determine w_{pc}, Gain margin and comment on stability. **[12]**

SECTION - II

Q7) a) Determine the controllable canonical and observable canonical state model of the system with transfer function $G(s) = \dfrac{4s^2+9s+10}{s^3+5s^2+9s+4}$. **[8]**

b) Investigate for complete state controllability and state obsenability if state space model matrices are

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & -12 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \qquad \textbf{[8]}$$

OR

Q8) a) Determine state transition matrix of $A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}$ **[8]**

b) State and derive properties of state transition matrix. **[8]**

Q9) a) Sketch step and ramp response of P, PI and PID controllers. **[8]**

b) Describe architecture of PLC. **[8]**

OR

Q10) a) Write a short note on PID controller. **[8]**

b) Explain PI and PD controllers with the help of their equation, transfer function and block diagram. **[8]**

Q11) Write short notes on :

a) Self tuning regulator. **[9]**

b) Digital control **[9]**

OR

Q12) Write short notes on :

a) Distributed control system. **[9]**

b) SCADA **[9]**

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