Total No. of Questions : 8]

SEAT No. :

P2948

[Total No. of Pages : 3

[5669]-537

T.E. (Electrical)

CONTROL SYSTEM - I

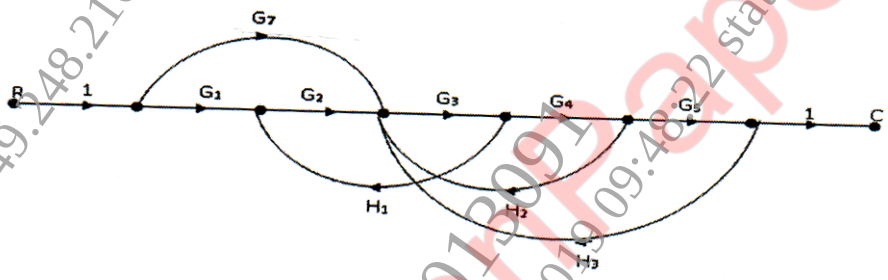
(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer all questions.***
2) ***Use of non programmable calculator is allowed.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Find transfer function using Mason gain formula. **[7]**

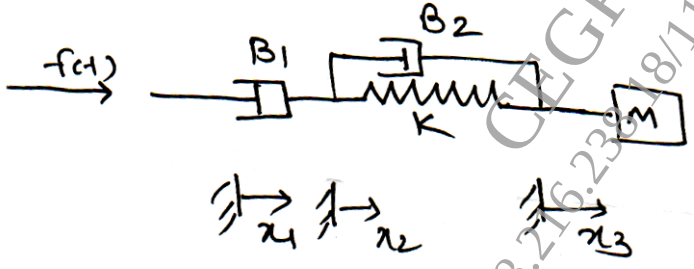


b) For the unity feedback system with $G(s) = \frac{4900}{s(s+70)}$ find peak overshoot, settling time, for unit step input. What is steady state error for an input of 5tu(t). **[6]**

c) Construct Root Locus for unity feedback system with open loop transfer function given as $G(s) = \frac{K(s+1.5)}{s(s+1)(s+2)}$ **[7]**

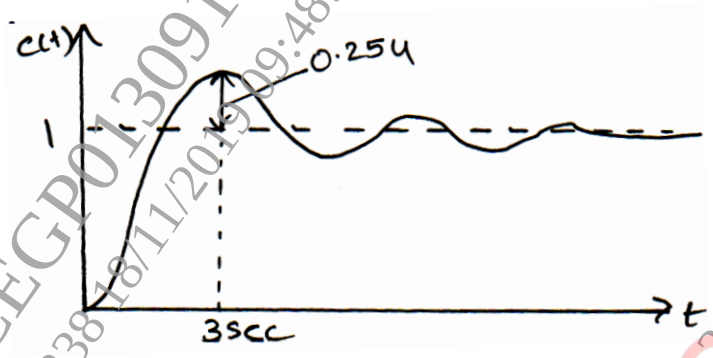
OR

Q2) a) Draw electrical analogues network for given mechanical system in F-V analogy and write differential equations. **[7]**



P.T.O.

b) For system with G(s) = $\frac{K}{s(Ts+1)}$, H(s) = 1 is subjected to a unit-step input, the system output responds as shown in Fig. Determine the values of K and T from the response curve. **[6]**



c) Find the positive value of K and a such that system with unity feedback and G(s) = $\frac{K(s+1)}{(s^3+as^2+2s+1)}$ oscillates at frequency of 2 rad/sec. **[7]**

Q3 a) Explain correlation between frequency domain and time domain. **[6]**

b) Sketch polar plot for system with open loop transfer function as **[10]**

G(s) = $\frac{50}{s(s+3)(s+6)}$ Obtain gain margin and phase margin.

OR

Q4) a) Explain Nyquist stability criterion. **[6]**

B) For Unity feedback system G(s) = $\frac{K}{(s+2)(s+4)(s+6)}$ plot Nyquist diagram. Find range of K for stability. **[10]**

Q5) a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin. **[6]**

b) Sketch the bode plot for system with open loop transfer function as G(s) = $\frac{75(1+0.2s)}{s(s+3)}$. Determine from that wgc,wpc,GM,PM and comment on stability. **[12]**

OR

Q6) a) State advantages of bode plot. **[6]**

b) Sketch bode plot for system with open loop transfer function as $G(s) = \frac{K}{s(1+0.02s)(1+0.04s)}$ consider K = 1. Determine from that wgc, wpc, GM, PM. **[12]**

Q7) a) Explain P, PI, PID controller with their advantages and limitations. **[8]**

b) Obtain the tuning of PID controller for a unity feedback system with open loop transfer function as using Ziegler Nichols method $G(s) = \frac{12}{s(s^2+4s+13)}$ **[8]**

OR

Q8) a) Explain Ziegler Nichols method of PID tuning when dynamic model of system is not available. **[8]**

b) Obtain the tuning of PID controller for a unity feedback system with open loop transfer function as given $G(s) = \frac{1}{(s+1)(s+3)(s+5)}$ using Ziegler Nichols method. **[8]**

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