Total No. of Questions : 8] **SEAT No. :**

P2591 **[Total No. of Pages :3**

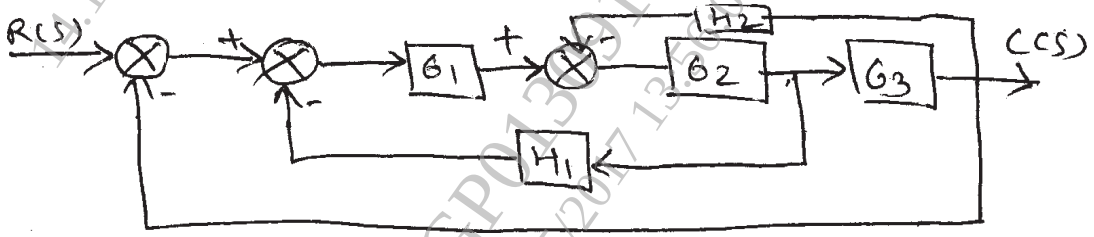
[5153]-567
T. E. (Electrical)
CONTROL SYSTEM-I
(2012 Course) (Semester-II) (303147)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer all questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Derive transfer function using block diagram reduction. **[6]**



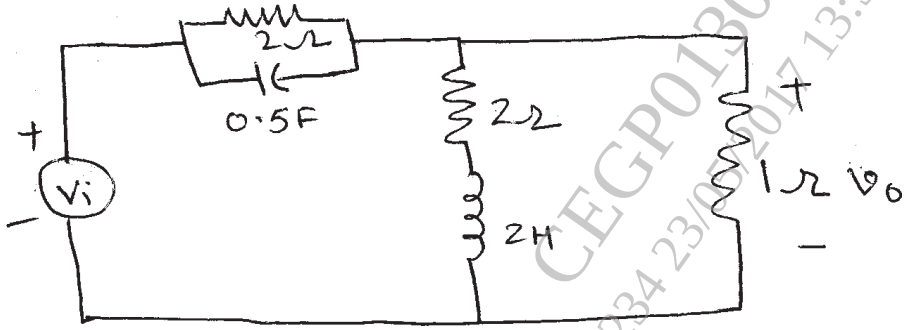
b) Derive transfer function of DC servomotor(armature control). **[7]**

c) Derive time response of unit step input to first order system. Sketch the response. **[7]**

OR

Q2) a) Explain F-V analogy and F-I analogy. **[6]**

b) Determine transfer function of following electrical network **[7]**



c) What is type and order of system. Explain effect of type of system on steady state error. **[7]**

P.T.O.

Q3) a) Define stability and give necessary condition for stability. **[4]**

b) Explain For unity feedback system with open loop transfer function given as $G(s)=\frac{K}{s(s+1)(s^2+4s+13)}$. Draw root locus when K is varied from 0 to ∞. Also find range of values of K for which system is stable. **[12]**

OR

Q4) a) Using Routh Hurwitz criterion for the unity feedback control system with open loop transfer function $G(s)=\frac{K(s+13)}{s(s+3)(s+7)}$ **[8]**

i) Find range of values of K for the system to be stable

ii) Find the value of K for marginally stable system and corresponding close loop poles and frequency of sustained oscillations.

b) Explain any four rules for root locus. **[8]**

Q5) a) Draw bode plot for following system $G(s)=\frac{20(s+2)}{s(s+10)}$ Find gain margin and phase margin comment on stability. **[12]**

b) Explain different frequency domain specifications. **[6]**

OR

Q6) a) Explain how gain margin and phase margin are determined in bode plot and stability from that. **[6]**

b) Explain nyquist stability criterion. Sketch nyquist plot for the system with open loop transfer function given by $GH(s)=\frac{20}{(s+2)(s+3)}$ comment on stability of system. **[12]**

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

b) A unity feedback system has the plant transfer function $G(s)=\frac{C(s)}{M(s)}=\frac{10}{s(s+2)}$. A proportional plus derivative control is employed to control the dynamics of the system. Determine

i) The damping factor and undamped natural frequency when Kd = 0

ii) The value of Kd such that damping factor is 0.6 **[8]**

OR

Q8) a) Explain Ziegler Nichols method of tuning PID controller. **[8]**

b) Using Ziegler Nichols method design a PID controller for system with open loop transfer function $H(s) = \frac{15}{s(s+1)(s+3)}$. Write close loop transfer function of plant including PID controller. **[8]**

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