Dt- 05/06/2017

T2225A / T0544 CONTROL SYSTEMS

TE/MTRX/Sem-V/CBSGLS

Q P Code: 09920

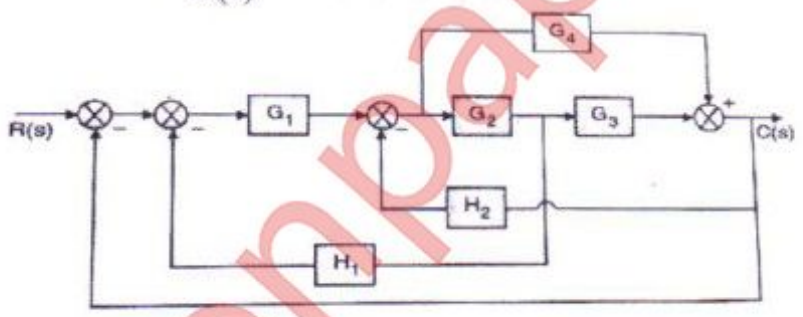
(3 hours) Total

Marks: 80

N.B.: (1) Question No. 1 is compulsory.
(2) Solve any three questions from remaining five questions.
(3) Draw neat diagrams and assume suitable data wherever necessary. Justify your assumptions.

1. Attempt any **four**: 20
   (a) Compare open loop and closed loop control system.
   (b) Differentiate analog and digital control system.
   (c) State and explain rules for constructing a root locus.
   (d) Explain the terms i) Centroid ii) Angle of asymptotes ii) break away point.
   (e) Write a short note on digital control system.

2. (a) Find the transfer function $\frac{C(s)}{R(s)}$ using Block Diagram Reduction Technique: 10



   (b) Draw the Nyquist plot if the given system and comment on its stability. 10
   $G(s) = \frac{1}{s(s+4)(s+8)}$.

3. (a) A feedback control system has open loop transfer function 12
   $G(s)\,H(s) = \frac{k}{s(s+4)(s^2+4s+20)}$
   Plot the root locus for k=0 to ∞ indicate all the points on it.
   (b) Explain the realization of lag-lead compensator using electrical network. 8

4. (a) For the control system shown below find k_1 and k_2 so that $M_p = 25\%$ and $t_p = 4$ sec. Also find i) Settling time ii) Rise time 10

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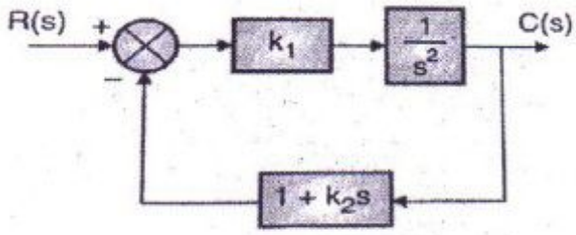

(b) Define i) Delay Time ii) Rise Time iii) Peak Time iv) Settling Time v) Peak overshoot 10

5. (a) For the transfer function given below $G(s)\,H(s) = \frac{48\,(s+10)}{s(s+20)(s^2+2.4s+1)}$ 10

Find:
i) Static position error coefficient
ii) Static velocity error coefficient
iii) Static acceleration error coefficient
iv) Steady state error if the input to the system is unit step

(b) For the unity feedback control system $G(s) = \frac{10}{s(s+1)(s+5)}$. Sketch the bode plot. 10

Determine gain and phase margin.

6. (a) Explain implementation of digital controller in temperature control system. 10

(b) Find the range of k so that the following system are stable using Routh's stability criteria: 10

i) $s^4 + 7s^3 + 10s^2 + 2ks + k = 0$

ii) $s^3 + 3ks^2 + (k+2)s + 4 = 0$

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