Q.P. Code :16469

[Time: Three Hours]   [Marks:80]

Please check whether you have got the right question paper.

N.B: 1.   Question No 1 is **compulsory**.
        2.   Attempt any **three** questions from remaining **five** questions.
        3.   Assume suitable data if required.
        4.   Figure to the right indicates full marks.

Q.1   Attempt **any four** from the following   20
   a)   What are the properties of sate transition matrix?
   b)   How to find gain margin and phase margin from bode plot?
   c)   Explain any five rules of root locus plot.
   d)   Differentiate between open loop and close loop system.
   e)   Draw the step response of a second order undamped, under damped and critically damped system.
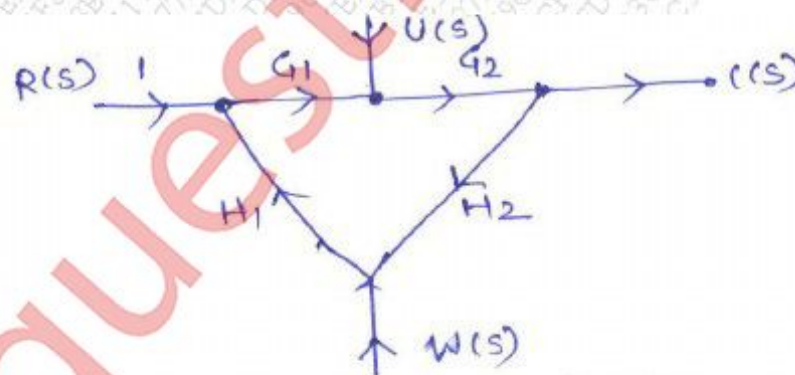
Q.2 a)   Find transfer function of the block diagram shown in figure 1 by using block diagram reduction method   10
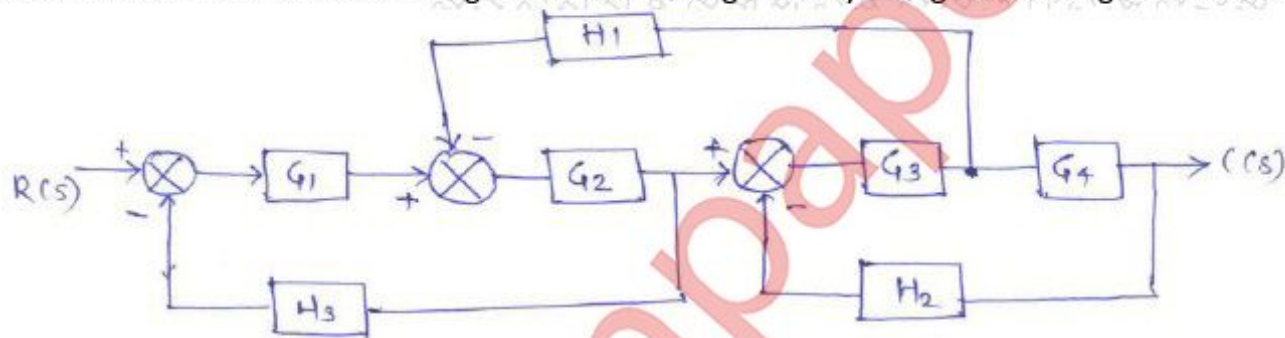
Figure 1

b)   Find the value of C(s).   10

Figure 2

092EF8E177DD96EBE279CFD3C57A2A8B

Q.3 a) For the unity feedback system having   10

$G(s) = \dfrac{10(s+1)}{s^2(s+2)(s+10)}$

Determine

   i.   Type of system

   ii.   Error coefficients and

   iii. Steady state error for i/p as $1 + 4t + \dfrac{t^2}{2}$

b) For the system shown below choose $V_1(t)$ and $V_2(t)$ as state variables and write down the state equations   10
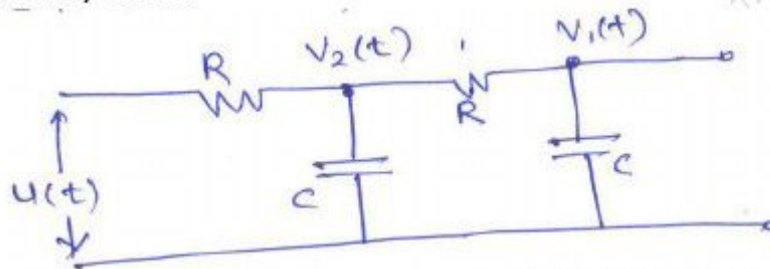satisfied by them.

Figure 3

Q.4 a) Sketch the root locus for an open loop transfer function of a control system   10

$G(s)H(s) = \dfrac{k}{s(s+4)(s^2+4s+10)}$

b) Sketch the bode plot and determine GM and PM for the transfer function   10

$G(s)H(s) = \dfrac{8(s+1)}{s(s^2+4s+5)}$

Q.5 a) Draw Nyquist plot for &   10

$G(s)H(s) = \dfrac{k(s+3)}{s(s-1)}$ and hence comment on stability

b) Determine stability   10

   i. $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 18$

   ii. $s^7 + 2s^6 + s^5 + 2s^4 - s^3 - 2s^2 - s - 2 = 0$

Q.6   Write short note on **any two** from the following   20

a) Co –relation between time domain and frequency domain specification.

b) Explain the effect of addition of poles and zeros to the system.

c) Different continuous composite controllers.