Registration no: | | | | | | | | | | |

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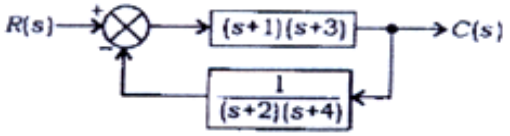
B.TECH
PCEC4303

5th Semester Regular Examination – 2014
CONTROL SYSTEM ENGINEERING
BRANCH(S): EC,ETC
Time: 3 Hours
Max marks: 70
Q.CODE: H163

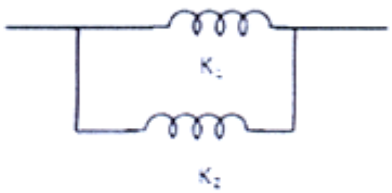
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Write the following questions (2 x 10)

a) For a signal x(t) the Laplace transform is, $x(s) = \frac{4s+7}{s(s+3)}$, then what is the initial value x(0+) of the signal x(t)?
b) Define rise time and settling time of a control system.
c) What is meant by dominant poles and insignificant poles of transfer function?
d) What is meant by stable and critically stable system?
e) For the block diagram representation of the figure shown below, determine the system characteristic equation.

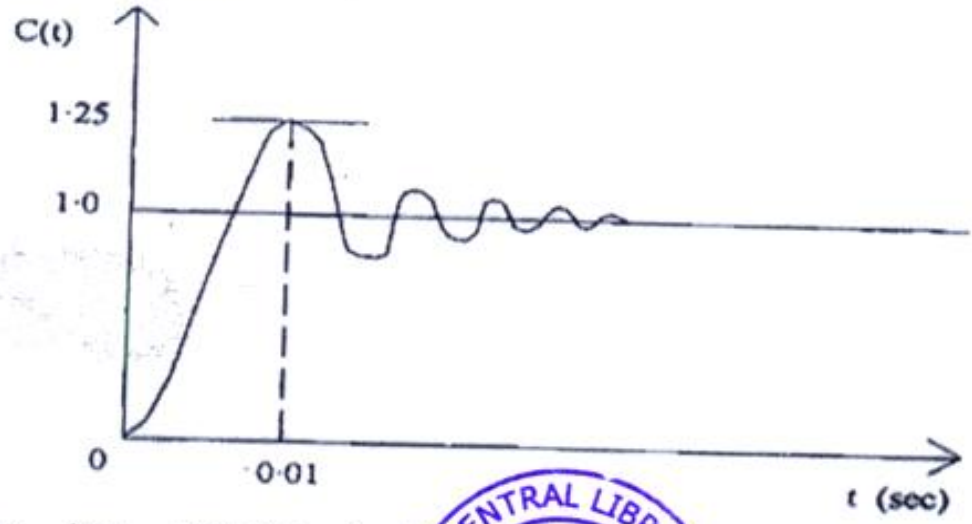


f) Explain Cauchy's principle of argument.
g) What do you mean by Transportation Lag? Write down the transfer function of the same.
h) Comment in brief on the 'effect of adding open loop poles and zeroes to the transfer function on root locus'.
i) How do you determine the Velocity error constant from the Bode Plot?
j) Determine the equivalent spring constant for the given system.



Q2 Derive Mathematical model for an Armature controlled DC servo motor. Find the closed loop transfer function between angular displacement θ and supply voltage V. Draw complete block diagram representation of the closed loop system. (10)

Q3 a) The unit step response of a linear control system is shown in below Figure. Find the transfer function of a second order prototype system to model the system. (10)



b) The loop transfer function of a system is given by

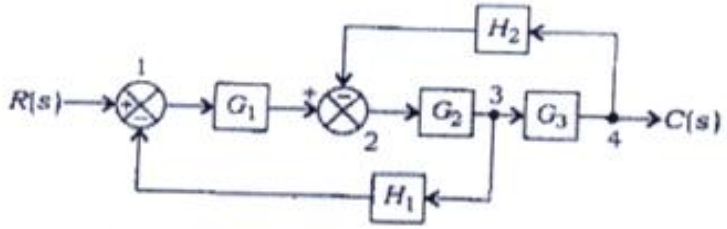
$$G(s)H(s) = \frac{7s+4}{s^2(s^3+4s^2+8s+8)}$$

Find the number of roots located on the imaginary axis and also their values using the Routh table.
Is there any root on the right hand side of the $s-$ plane?

Q4 Sketch the root loci of open-loop transfer function of the feedback control system given as (10)

$$G(s)H(s) = \frac{K(s+4)}{s(s+3)}$$

Q5 a) For the block diagram shown in the figure below, find the overall transfer function of the system. (5)



b) Verify the transfer function found above using signal-flow graph analysis. (5)

Q6 The open-loop transfer function of a system is

$$G(s) = \frac{K}{(1+0.1s)(1+s)}$$

a) Determine the value of K so that the gain margin is 15dB (5)
b) Determine the value of K so that the phase margin is 50^0 (5)

Q7 Draw the Bode magnitude and phase angle plots for the transfer function (4 + 6)

$$G(s) = \frac{1000(s+1)}{s(s+20)(s+50)}$$

Comment on stability of the system.

Q8 Write short notes on any two. (5 + 5)

a) Minimum phase and Non-minimum phase system
b) Effect of negative feedback
c) Gain Margin and Phase Margin
d) Constant M and N circles
e) PID controller