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

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B.TECH
PCEI4303

6th Semester Regular / Back Examination 2016-17
CONTROL SYSTEMS
BRANCH(S): AEIE, EIE, IEE
Time: 3 Hours
Max Marks: 70
Q.CODE: Z176

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

Q1 **Answer the following questions:** **(2 x 10)**

a) Write the Torque – Voltage analogy for viscous friction coefficient, Mass and stiffness constant.
b) What are the time domain specifications?
c) What is the difference between type and order of a system?
d) State the rule for finding out the root loci on the real axis.
e) Give the expression for Maximum peak overshoot for a second order system.
f) What is the application of Nichols chart?
g) What is an asymptote in a Bode plot?
h) What are the advantages and disadvantages of the lead compensation technique?
i) What is the effect of negative feedback on Bandwidth and Disturbance?
j) Write the difference between encircle and enclosed in Nyquist stability criterion.

Q2 **a)** Use Routh's criteria to determine the stability of a system, the characteristic equation of which is $3s^4 + 10s^3 + 5s^2 + 5s + 3 = 0$. **(5)**

b) Determine an approximate upper limit on the time delay for the unity feedback system with transportation lag having open loop transfer function as **(5)**

$$G(s) = \frac{e^{-sT}}{s(s+1)}$$

Q3 **a)** Obtain the polar plot of the given transfer function **(5)**

$$G(s) = \frac{e^{-j\omega L}}{(1+j\omega T)}$$

b) Explain in brief how to determine Gain Margin and Phase Margin in a polar plot. **(5)**

Q4 Given **(10)**

$$G(s)H(s) = \frac{20(s + 10)}{s(s + 1)(s^2 + 2s + 2)}$$

Draw Bode plot and find Gain Margin and Phase Margin.

Q5 **a)** A critically damped servomechanism has a maximum output speed of 120 rev/min. If the un-damped frequency is 8Hz, what is the largest possible error before the linear range of operation is exceed? **(5)**

b) The open loop transfer function of a unity feedback system is $(s) = \frac{K}{s(sT+1)}$, where K and T possible constants. How many times the gain should be increased to increase the overshoot from 40% to 60%. **(5)**

Q6 Draw the root loci for $0 < K < \infty$ of a unity feedback system with forward transfer function **(10)**

$$G(s) = \frac{K(s+1)}{s^2(s+5)}$$

Determine the value of gain K corresponding to maximum value of damping ratio.

Q7 Consider $G(s)H(s) = \frac{10(s+3)}{s(s-1)}$. Draw the complete Nyquist plot and then determine the stability of closed loop system. **(10)**

Q8 **Answer any two:** **(5 x 2)**

a) Synchros.

b) AC Tachometer.

c) PID Controller.

d) Generalized Static Error Coefficient.