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

Total Number of Pages: 02 **B.Tech.**
PCEC4303

5th Semester Back Examination 2017-18
Control System Engineering
BRANCH : AERO, CSE, ECE, EEE, ELECTRICAL, ETC, IT, ITE
Time: 3 Hours
Max Marks: 70
Q.CODE: B238
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 :** **(2x10)**

a) What are the time response specifications?
b) Draw the Bode plot for a proportional Integral controller. What are the effects of integral control action?
c) Find how many unstable roots are there for $f(s)=s^5+4s^4+8s^3+9s^2+6s+2$
d) Distinguish between absolute stability, conditional stability and relative stability.
e) Define 'state variables'. What considerations/constraints should be taken into account while choosing the state variable?
f) Write down the usefulness of different control actions for a PID controller.
g) Explain the principle of Argument.
h) Explain gain margin and phase margin.
i) Illustrate through example the effect of addition of pole and zero on the shape of the root locus.
j) State and explain the different terms in Mason's Gain Formula.

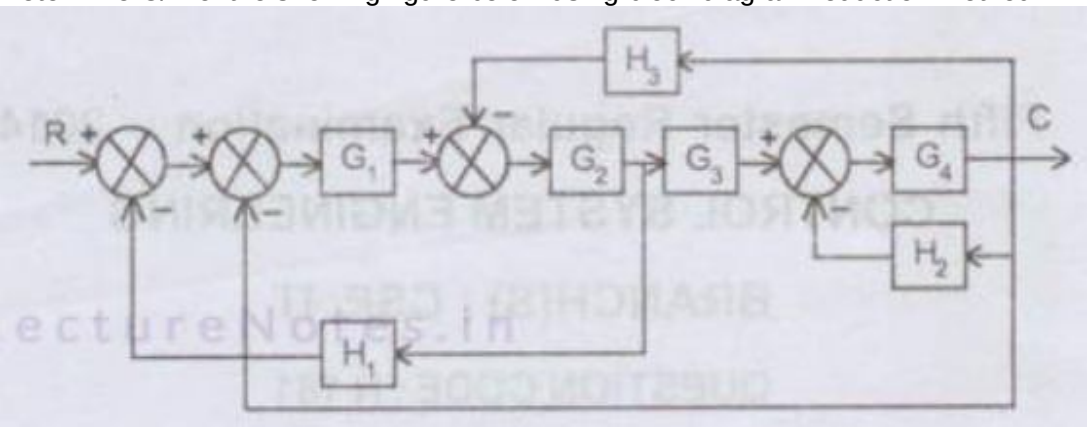
Q2 **a)** A control system is represented by following characteristic equation $q(s)=s^4+2s^3+3s^2+s+5$. Check the stability by Hurwitz criterion. **(5)**

b) Sketch the root locus plot of a unity feedback system with forward path gain $G(s)=\frac{K}{S(S+2)(S+4)}$. Find the range of K for which the system is under damped? **(5)**

Q3 **a)** Describe the construction, working and applications of an Amplidyne. **(5)**

b) Sketch the polar plots i) $G(s)H(s)=\frac{1}{1+ST}$ *ii)* $G(s)H(s)=\frac{1}{S(1+ST)}$ **(5)**

Q4 Determine C/R of the showing figure below using block diagram reduction method **(5)**



b) Draw the Bode magnitude and phase plot of the following open loop transfer function **(5)**

$G(s)=\frac{1}{S(S+1)}$.

Q5 **a)** Derive the expression for generalized error co-efficient. **(5)**

b) The open loop transfer function of a system with unity feedback is given by **(5)** $G(s)=\frac{200}{S(S+5)}$. Using error series, determine the steady state error of the system for the input $r(t)=(3+4t)t$.

Q6 **a)** State and Explain the Nyquist stability Criterion. **(5)**

b) **(5)** Consider a feedback control system with characteristics equation $1+K\frac{1}{S(+1)(S+2)}$.

Draw the root locus of the system showing the centroid, break away points and branches of the root locus.

Q7 For a second order system, obtain an expression for damping ratio in terms of peak overshoot. **(10)**

For a second order system, the unit step response is found to have maximum overshoot of 18% and peak time of 0.25 secs. Find the natural and damped frequency of oscillations and the locations of the second order poles.

Q8 **Write short answer on any TWO :** **(5x2)**

a) Nichol's Chart

b) AC Tachogenerator

c) PID Controller

d) Static error Constants