Registration No :

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

PCEI4303

6th Semester Back Examination 2017-18

CONTROL SYSTEMS

BRANCH : AEIE, BIOMED, EIE, IEE

Time : 3 Hours

Max Marks : 70

Q.CODE : C487

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Answer all parts of a question at a place.

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

a) Write the difference between closed loop and open loop control system.

b) What are the effects of integral control action?

c) Find the damping ratio and damping co-efficient of the system described by closed loop transfer function $G(s)=\frac{64}{s^2+16s+64}$.

d) Differentiate between centroid and break away point of a root locus.

e) State the specification time domain second order control system.

f) What do you mean by "Impulse Response" of a transfer function? Why is it called so?

g) The closed loop transfer function of a control system is given by $\frac{C(s)}{R(s)}=\frac{1}{1+S}$.

For the input r(t) =cos(t). Determine the steady-state response c(t).

h) State the limitations of R_H criterion.

i) State the Mason's gain formula with usual meanings.

j) Write the difference between type and order. Find the type and order of the given transfer function $G(s)=\frac{200(S+2)(S+5)}{S^5(S+10)(S^2+3S+9)}$.

Q2. **a)** In a gear train, derive the expression for the motor torque referred to the motor sides as well as load side. What is the analogue of gear train in an electrical system? **(5)**

b) The open loop transfer function of a unity negative feedback system is $G(s)=\frac{K}{S(S+15)}$. If K=225, what change must be made in the system to reduce the peak overshoot by 50%, keeping the settling time the same. **(5)**

Q3. A feedback control system has an open loop transfer function $G(s)=\frac{K}{S(S+3)(S^2+2S+2)}$. Find the root locus as K varied from zero to infinity. **(10)**

Q4. **a)** Discuss the Zeigler-Nicholas's method for tuning PID controllers. **(5)**

b) Draw the polar plot of $G(s)=\frac{5}{S(1+S)}$. **(5)**

Q5. **a)** A unity feedback control system has the closed loop transfer function $T(s)=\frac{as+K}{s^2+bs+K}$. Show that the steady-state error is zero for a unit ramp input, if a=b. **(5)**

b) Determine the GCF, PCF, GM and PM of a system with open loop transfer function $G(s)=\frac{1}{S(S+1)(1+2S)}$. **(5)**

Q6. **a)** State Nyquist stability criterion. Define the gain margin and phase margin. Why the gain margin determined at the phase is cross over frequency and phase margin at the gain cross over frequency. **(5)**

b) Using R-H criterion, investigate the stability of the system whose characteristic equation is $S^5+4S^4+8S^3+8S^2+7S+4=0$ **(5)**

Q7. Draw the Bode magnitude and phase angle for the transfer function $G(s)=\frac{1000(S+1)}{S(S+20)(S+50)}$. **(10)**

Q8. **Write short answer on any TWO :** **(5 x 2)**

a) M-Circles

b) Bode Plot

c) Routh Criterion

d) Error Constants