

Registration No :

--	--	--	--	--	--	--	--	--	--

Total Number of Pages : 02

B.Tech  
PCEC4303

5<sup>th</sup> Semester Back Examination 2018-19  
CONTROL SYSTEM ENGINEERING

BRANCH : AERO, BIOMED, CSE, ECE, EEE, ELECTRICAL, ETC, IT, ITE

Time : 3 Hours

Max Marks : 70

Q.CODE : E624

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)

- In the multi-loop control system positive feedback is intentionally given in inner loop. Justify.
- Mention the analogous quantities for mechanical (translational systems) and electrical systems in Force-Voltage analogy.
- A system has a transfer function  $G(s) = \frac{50}{s + 50}$ . Find the time constant, rise time and settling time.
- Define State and State Transition Matrix.
- What is meant by break-away and break-in point in root locus ?
- Define How Minimum phase, Non-minimum phase transfer functions.
- Why Nichol's chart is required in control system?
- What is Shannon's sampling theorem?
- Explain the principle of arguments.
- What is phase margin and gain margin?

Q2 a) Draw the Signal Flow Graph for the following algebraic equation and find the transfer function.

(5)

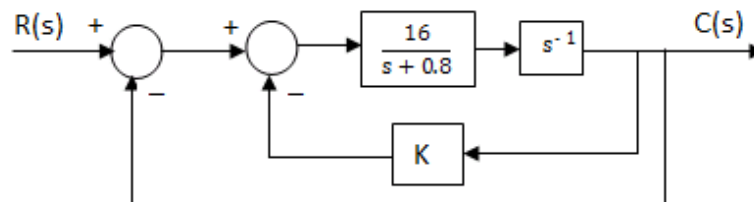
$$x_1 = -2x_2 - 4x_3 + 2$$

$$x_2 = 4x_1 - 3x_2 - x_3$$

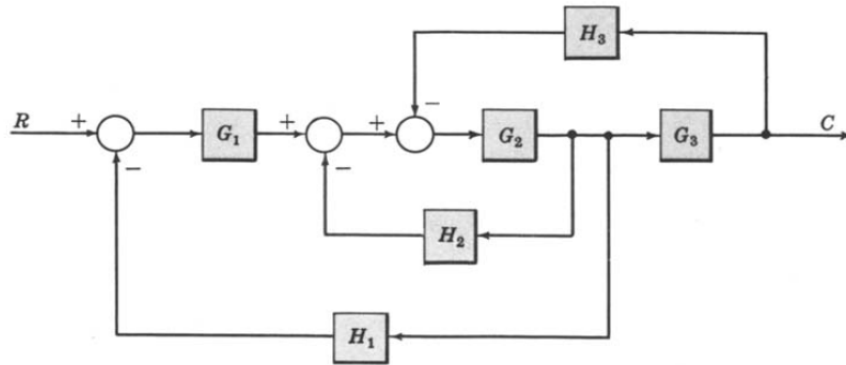
$$x_3 = 5x_1 + 2x_2 - 10x_3 + 1$$

b) Determine the value of 'K' such that the damping ratio  $\zeta$  is 0.5 for the following system. Find the rise time, peak time, peak overshoot and settling time for 2% tolerance.

(5)



Q3 a)



(5)

Find the transfer function  $C/R$  using block diagram reduction techniques.

b) Discuss the Zeihler-Nichol's PID controller tuning methods.

(5)

Q4 a) Investigate the stability of the closed loop system from the given open loop transfer function  $G(s)H(s) = \frac{K(s+2)}{(s+1)(s-1)}$  using Nyquist criterion.

(5)

b) What do you mean by sensitivity? Explain how negative feedback is effective on sensitivity in comparison to open loop control system.

(5)

Q5 a) The open loop transfer function of a unity feedback control system is given by

(5)

$G(s) = \frac{K}{s(s+1)(s+10)}$ . Sketch the asymptotic bode plot and determine the value of  $K$  such that the gain margin is 10 dB.

b) Find the steady state error of Type-2 system for different test signals and compare with type 0 and type 1 systems.

(5)

Q6 a) With neat sketch explain the operation of a synchro transmitter of a synchro transducer.

(5)

b) The characteristic of a closed loop control system is given as  $s^4 + 10s^3 + 35s^2 + 50s + 24 = 0$ . Determine number of roots to the of vertical axis located at  $s = -2$

(5)

Q7 What are the two basic Evan conditions for root locus ?Sketch the root locus plot for the system when open loop transfer function is given by

(10)

$$G(s)H(s) = \frac{K}{s(s+4)(s^2+4s+13)}$$

Q8 Write short answer on any TWO :

(5 x 2)

- AC servomotor.
- Zury's stability test.
- Frequency domain specifications.
- Constant M and constant N circle.