C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name: Linear Control Theory

Subject Code: 4TE05LCT1 Branch: B.Tech (Electrical)

Semester: 5 Date: 24/3/2017 Time: 2:30 to 5:30 Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 Attempt the following questions:

(14)

- a) Which system is also known as automatic control system?
 - (a) Open loop control system (b) closed loop control system (c) either 1 or 2 (d) neither 1 nor 2
- **b**) Which of the following is an open loop control system?
 - (a) Field controlled D.C. motor (b) Ward Leonard control (c) Metadyne (d) None of the above
- **c**) By using which of the following elements, mechanical translational systems are obtained?
 - (a) mass element (b) spring element (c) dash pot (d) all of the above
- d) If two blocks having gains A and B respectively are in series connection, find the resultant gain using block diagram reduction technique?
 (a)A+B (b) A-B (c) A*B (d)A/B
- e) At summing point, more than one signal can be added or _____
 - (a) Subtracted (b) Multiplied (c)Both a & b (d) None of the above
- f) In a signal flow graph method, how is an overall transfer function of a system obtained?
 (a) Poisson's equation
 (b) Mason's equation
 (c) Block Diagram reduction rules
 (d) Lagrange's equation
- g) Closed loop systems are costly and complicated (a) True (b) False
- h) Define: Transfer function
- i) Define: Source node
- **j**) Which of the following is the analogous quantity for mass element in force-voltage analogy?
 - (a)resistance (b) inductance (c) capacitance(d)all of the above
- k) Define: Control System.
- In liquid level and electrical system analogy, voltage is considered analogous to (a) head (b) liquid flow (c) liquid flow rate (d) none of the above
- m) The characteristic equation of a feedback control is 2s4 + s3 + 3s2 + 5s + 10 = 0. The no of roots in the right half of the s-plane is



(a)2 (b)3 (c)4 (d)0

n) Signal will become zero when the feedback signal and reference signs are equal.(a) Input (b) Actuating (c) Feedback (d) Reference

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- (a) Explain the difference between Open loop and Close loop control system with examples. (07) Compare their merits and demerits.
- (b) Derive the expression for static error coefficient. (07)

Q-3 Attempt all questions (14)

(a) Using the block diagram reduction techniques, find the closed loop transfer Function of the system whose block diagram is given in Fig.1.

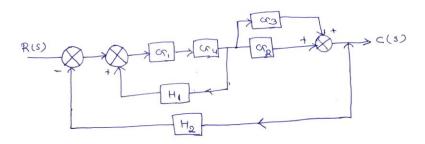


Fig.1

(b) Obtain overall transfer function C(s)/R(s) of the system whose signal flow graph shown in Fig.2. (07)

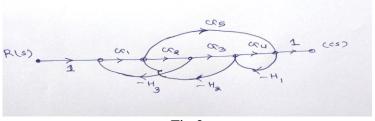


Fig.2

Q-4 Attempt all questions (14)

- (a) What is analogus system? Establish force voltage and force current analogy. (07)
- (b) Obtain the state model of the given electrical system. (07)

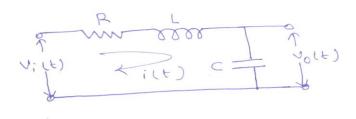


Fig 3

Q-5 Attempt all questions (14)

(a) Draw equivalent diagram and write the equilibrium equation for the given mechanical system. Fig 4





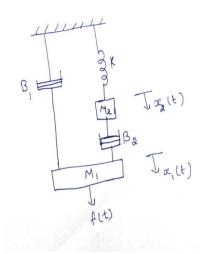


Fig 4

	(b)	Derive the transfer function of simple Liquid level system.	(07)
Q-6		Attempt all questions	(14)
	(a)	Define the Term	(07)
		i)Time Response ii)Transient Response iii)Steady state response iv)steady state error	
		v) Delay time vi) Rise time vii) Peak Time	
	(b)	For system $s^4 + 22s^3 + 10s^2 + s + K = 0$, find K_{mar} and ω at K_{mar} .	(07)
Q-7		Attempt all questions	(14)
	(a)	For a unity feedback system , $G(s) = \frac{K}{s(s+2)(s+10)}$. Find the Marginal Value of 'K' for	(10)
		which system will be marginally stable, using bode plot.	
	(b)	What are Advantages of Bode Plots?	(04)
Q-8		Attempt all questions	(14)
	(a)	Sketch the Root Locus for the system having G(S) H(S) = $\frac{K}{s(s+1)(s+3)}$.	(10)
	(b)	What are Advantages of Root Locus Method?	(04)