Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code: 2141708 **Date:22/12/2015**

Subject Name: Control Systems

Time: 2:30pm to 5:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Draw unit step response of a second order control systems. Describe all specification in detail.	**07**
	(b)	Write the advantages and disadvantages of open and closed loop control system. Give examples for each type of system.	**07**
Q.2	**(a)**	In a closed loop system, open loop system transfer function is given by G(s)= $\frac{k}{s(s^2+s+1)(s+4)}$ .Find out k for which system is stable. Find roots on imaginery axis.	**07**
	(b)	Explain the nyquist stability criterion.	**07**
		OR	
	(b)	Write the rules for block diagram Reduction technique.	**07**
Q.3	**(a)**	Draw the Root Locus for an open loop Transfer function G(s)= $\frac{k}{s(s+1)(s+5)}$ for different values of k=0 to ∞.	**10**
	(b)	Check the system stability for system whose characteristic equation is given by $s^4+8s^3+18s^2+16s+5=0$.	**04**
		OR	
Q.3	**(a)**	Draw the Root Locus for an open loop transfer function G(s)= $\frac{k}{s(s^2+2s+5)(s+2)}$.	**10**
	(b)	Check the system stability for system whose characteristic equation is given by $3s^4+10s^3+5s^2+5s+2=0$	**04**
Q.4	**(a)**	Derive the transfer function V0(s)/Vi(s) for fig 1.	**07**
	(b)	Draw the bode plot for an open loop transfer function given by G(s)H(s)= $\frac{10(1+0.5s)}{s(0.1s+1)(0.2s+1)}$ .Find Gain magin and Phase Margin,	**07**
		OR	
Q.4	**(a)**	Write the differential equation governing the behavior of mechanical system given in fig 2.	**07**
	(b)	Draw the bode plot for an open loop transfer function given by G(s)H(s)= $\frac{64(s+2)}{s(s+0.5)(s^2+3.2s+64)}$	**07**

Q.5 **(a)** Using block diagram Reduction technique , derive the overall transfer function C/R for diagram given in fig 3. **07**

(b) Draw the nyquist plot for the following loop transfer function G(s)H(s)= $\frac{(s+2)}{(s+1)(s-1)}$. **07**

OR

Q.5 **(a)** Using block diagram Reduction technique derive the overall transfer function C/R for diagram given in fig 4. **07**

(b) Find the transfer function for the fig. 5 using signal flow graph. **07**

fig 1 (Q:4(a))

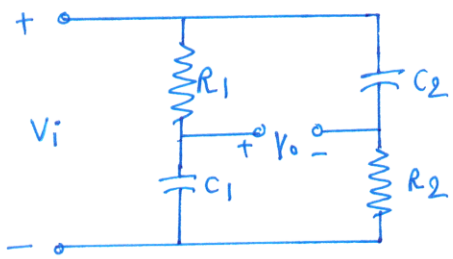


fig : 2 (Q:4(a))

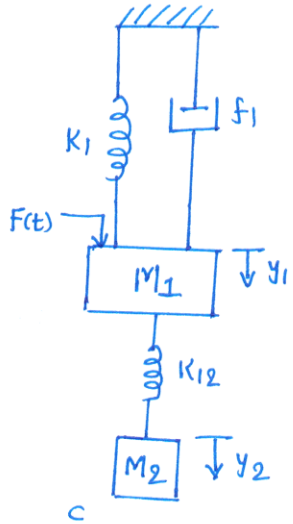


fig:3

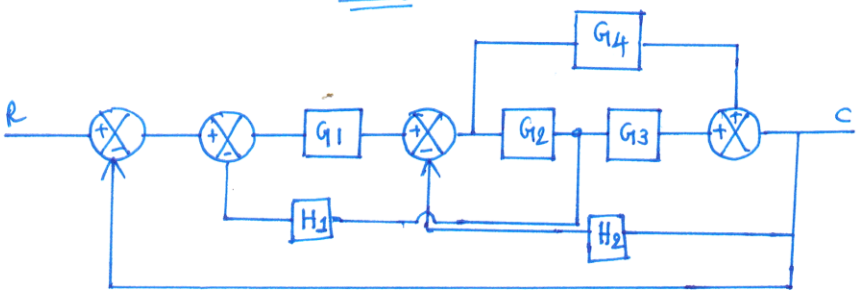


fig:4

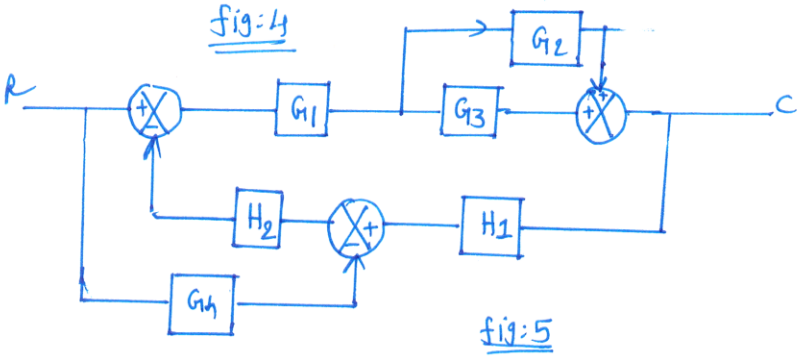
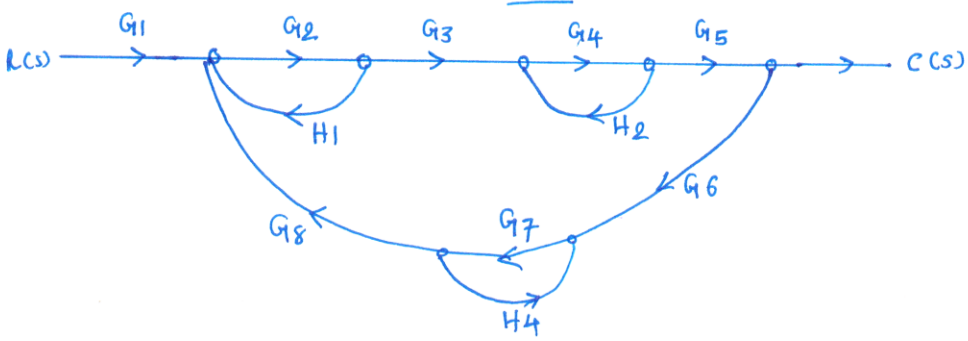


fig:5



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