Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2151908 **Date: 18/12/2019**

Subject Name: Control Engineering

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

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

			MARKS
Q.1	**(a)**	What is control Engineering ? Claassify it	**03**
	(b)	What is state space analysis in control engineering ? explain advantage of state variable method over conventional one.	**04**
	(c)	Determine the system equations for the physical system shown in figure 1.c	**07**
Q.2	**(a)**	Derive equation of transfer function for closed loop control system	**03**
	(b)	What is analogues system ? Explain force voltage analogy	**04**
	(c)	Reduce block diagram by block reduction technique and find the overall transfer function in figure 2c	**07**
		OR	
	(c)	Apply masons rule and find the transfer function for following figure.2c (or)	**07**
Q.3	**(a)**	Explain standard test signals used in control engineering	**03**
	(b)	For a first oder system with unit step input find the steady state error and explain it	**04**
	(c)	A unity feed back control system has an open loop transfer function G(s) = 5/s(s+1) find the peak time, rise time, percentage overshoot settling time for step input of 20 units. Also determine the peak overshoot.	**07**
		OR	
Q.3	**(a)**	Define position error constant, velocity error constant , Acceleration error constant.	**03**

	(b)	Derive the equation for peak time , rise time, and for second order system for underdamped system	**04**
	(c)	The control system shown in figure 3 b. employs proportional plus error rate control. Determine the value of error rate constant Ke, so that damping ratio is 0.5. Determine the value of settling time, maximum overshoot . Find the steady state error if the input is unit ramp input.	**07**
Q.4	**(a)**	Explain nozzle flapper amplifier	**03**
	(b)	Explain basic hydraulic system component and draw any circuit showing at least six components	**04**
	(c)	Explain pneumatic proportional plus integral control action and obtain its transfer function.	**07**

OR

Q.4	**(a)**	Differentiate hydraulic and pneumatic control system	**03**
	(b)	Explain 3/2 DCV, 3/3 DCV , directional control valve with its construction figure.	**04**
	(c)	Obtain the transfer function for hydraulic system with proportional plus integral plus derivative control action.	**07**
Q.5	**(a)**	Explain terms; stable system, unstable system, marginally stable system	**03**
	(b)	Write a short not on bode plot	**04**
	(c)	For a system having characteristic polynomial $S^6 + 4S^5 + 16S^3 + 41S^2 + 36S + 72$ discuss about the stability criteria using routh stability theory.	**07**

OR

Q.5	**(a)**	Explain terms; critically stable system, conditionally stable system, relative stability	**03**
	(b)	Write a short note on Niquest stability criteria.	**04**
	(c)	Sketch the root locus of the system whose open loop transfer function is G(s) = K/S(S+1)(S+3) , determine the value of K for damping ratio equal 0.5	**07**

Figures (C.E.)

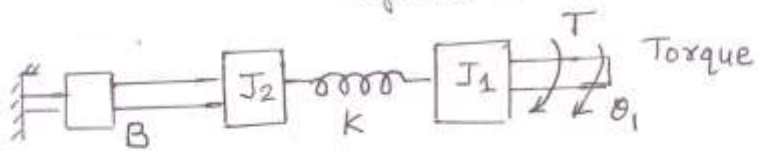


Fig 1 (c)

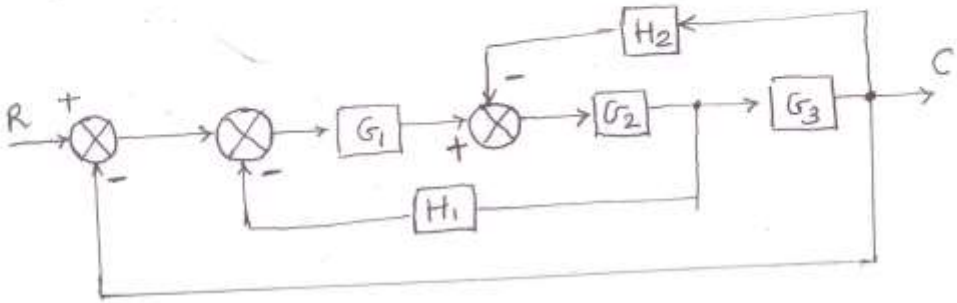
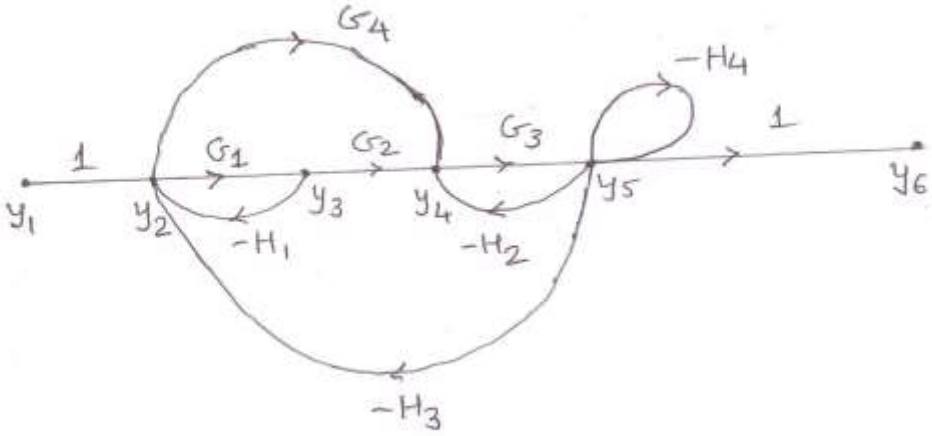


Fig 2 (E)



OR Fig 2 (E)

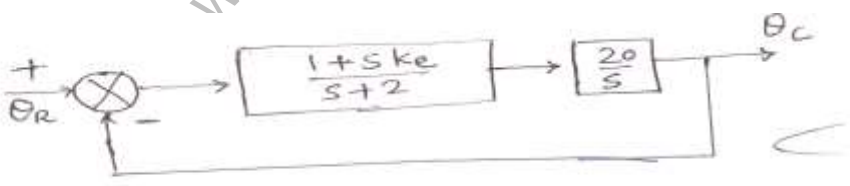


Fig 3 (E)

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