Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2160104 **Date: 26/10/2016**

Subject Name: Basic Control Theory

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

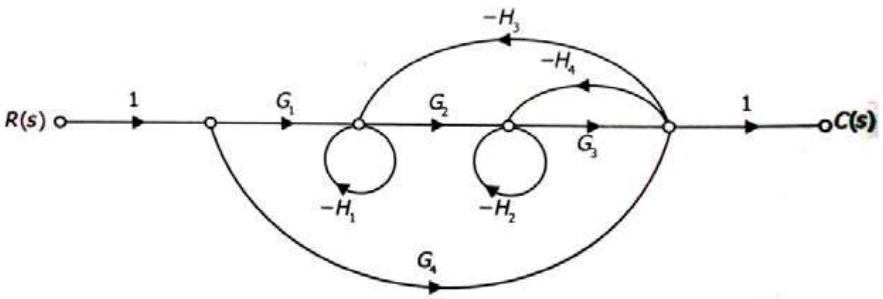
Instructions:

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

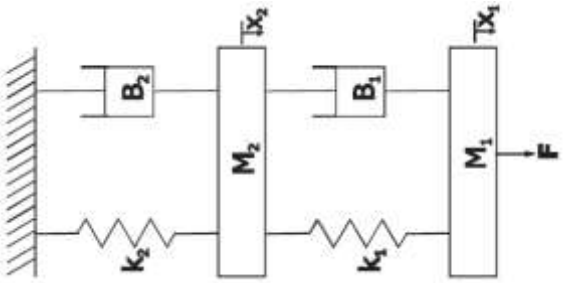
Q.1 **(a)** Define following terms with necessary diagrams. **07**
(i) Delay Time (ii) Rise Time (iii) Peak overshoot (iv) Peak Time (v) Settling Time (vi) Steady State Error

(b) Explain Standard Test Signals used in control system. **07**

Q.2 **(a)** Using Mason's Gain Formula, Find the transfer function C(S)/R(S) for the Signal Flow Graph shown in figure. **07**

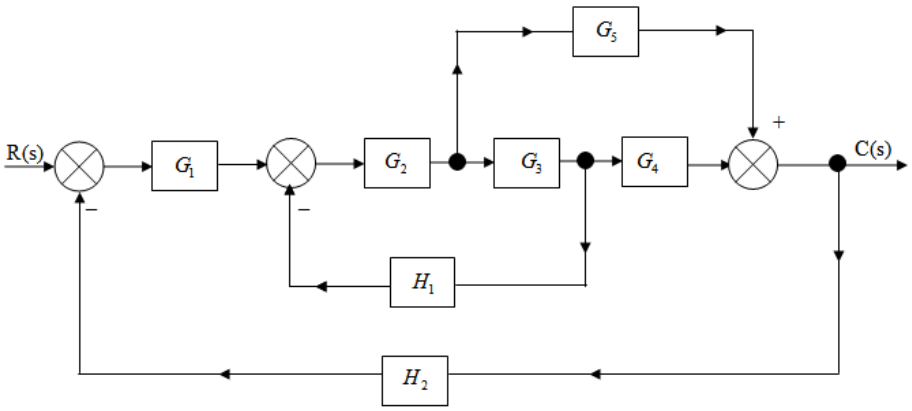


(b) For the mechanical system shown in figure, (1) Draw the node diagram (2) Write System equations of performance (3) Draw Force to Voltage analogous circuit. **07**



OR

(b) Reduce the Block Diagram to its Simple Form and obtain C(S)/R(S). **07**



Q.3	**(a)**	Explain types of the system and steady state error constants for the same.	**04**
		By means of Routh criterion, determine the stability of the system described by characteristic equation, $S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$	**03**
	(b)	System 1 has transfer Function $G_1(s) = 30 / 4(S^2+3)(S+6)$ and system 2 has transfer function $G_2(s) = 2/(S+4)$ .Find cascade and parallel transfer Function for system 1and system 2. Write MATLAB program to find cascade, and parallel transfer function from given transfer Function.	**07**

OR

Q.3	**(a)**	A unity feedback control system has $G(s) = K/s(s+10)(s^2+4s+5)$. Determine the Range of K for closed loop system to stable.	**07**
	(b)	Explain ON-OFF controller with neutral zone.	**07**
Q.4	**(a)**	Draw the bode plot for the system having $G(s)H(s)=20/s(0.1s+1)$. Determine the Gain Margin and Phase Margin.	**07**
	(b)	Plot the root locus for given transfer function. $G(s) = K/s(s+1)(s+4)$.	**07**

OR

Q.4	**(a)**	Sketch the root locus for the system having $G(s)H(s)=K/s(s^2+2s+2)$.	**07**
	(b)	Which two plots constitute Bode plot? What steps are followed to sketch Bode plot? What are frequency response specifications? Explain with the help of diagrams.	**07**
Q.5	**(a)**	Draw and explain polar plots for type 0, 1 and 2 system.	**07**
	(b)	Explain Nyquist stability criterion for determining the stability of a control system.	**07**

OR

Q.5	**(a)**	Find the eigen values for the following matrix. $A=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$	**07**
	(b)	Compare classical control theory with conventional control theory.	**07**

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