Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI EXAMINATION – SUMMER-2015

Subject Code:161905 **Date:12/05/2015**

Subject Name: CONTROL ENGINEERING

Time:10:30 am to 01:00 pm **Total Marks: 70**

Instructions:

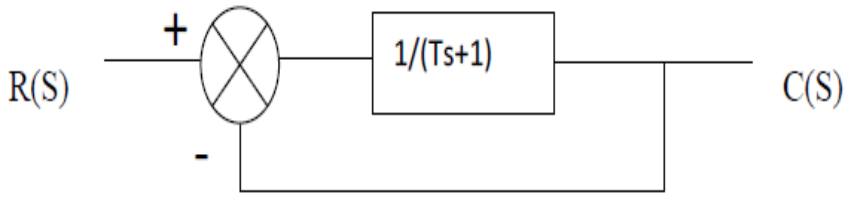
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What do you understand by Transient and steady state response and hence discuss the various types of input test signals used for time response analysis of a control system **07**

(b) Define transfer function of a linear time invariant control system and hence discuss its properties. Also discuss the role of Laplace Transforms in system analysis. **07**

Q.2 **(a)** With the help of suitable examples discuss open loop and closed loop control system **07**

(b) Consider a first order system as shown in Figure below. for a unit step input to the system, determine the output for one time period in the transient zone **07**



OR

(b) Define the various terms used for specifying the transient–response of a control system Explain them on the response curve of any one type of test signal **07**

Q.3 **(a)** What is meant by signal flow graph? Define the various terminologies associated and hence discuss the Mason's gain formula to determine the overall gain. **07**

(b) Describe force-voltage analogy and force- current analogy as applied to electrical analogies for mechanical systems. **07**

OR

Q.3 **(a)** Determine the transfer function X1/X2 for the physical system shown in figure 1 below. **07**

(b) With the help of fundamental differential equations draw the basic block diagram and hence derive the transfer function for a Armature controlled DC motor **07**

Q.4 **(a)** For a unity feed back system the open loop transfer function is given as follows. Sketch root locus for $0 \leq K \leq \infty$. at what value of K the system becomes unstable You may consider breakaway point as -0.8981. **10**

$$G(s) = \frac{K}{s(s+2)(s^2+6s+25)}$$

(b) Define stability of a control system? **04**

OR

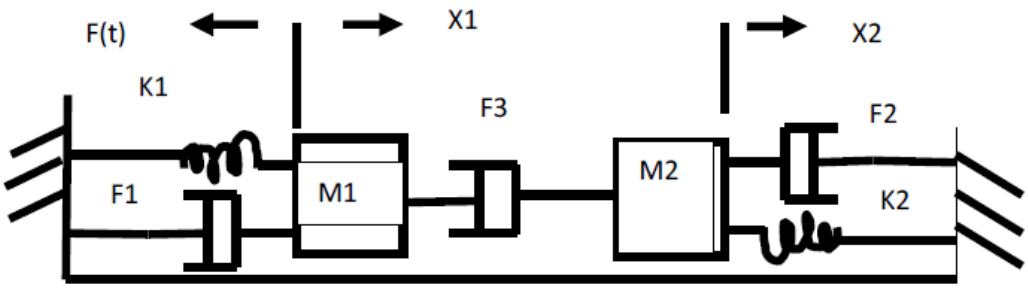
Q.4 **(a)** Determine the stability of a closed loop control system with characteristic equation $s^5+s^4+2s^3+2s^2+11s+10=0$ **07**

	(b)	With the help of a neat sketch explain the working of a pneumatic nozzle flapper amplifier and hence determine its transfer function	**07**
Q.5	**(a)**	Compare and contrast pneumatic system with hydraulic system	**07**
	(b)	Write a short note on Programmed logic controller and discuss its application to any engineering system	**07**

OR

Q.5	**(a)**	With the help of a neat sketch explain the working of a Automatic controller and discuss the various terminology used	**07**
	(b)	With the help of a sketch explain a pneumatic proportional plus integral controller and derive its transfer function	**07**

Figure 1 for Q3 a)



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