Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI- EXAMINATION – SUMMER 2016

Subject Code:160304 **Date:17/05/2016**

Subject Name:Bio-Medical 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 Control System. Enlist and Explain the different types of control system in detail. **07**

(b) What do you mean by Type 2 system and second order system? And explain the Effect of ζ (zeta) on second order system performance. **07**

Q.2 **(a)** A unity feedback system has G(s) = 20 (s+2) / s (s+1) (s+4). Determine (i) Type of the system, (ii) All error coefficient and (iii) Error for ramp input with magnitude 2. **07**

(b) For the system shown in figure, write the system equations and also draw the force-voltage analogy for that. **07**

OR

(b) A system is given by C(s) / R(s) = 1/ s^2 + s + 1. Find its rise time, peak time, peak overshoot and settling time if subjected to unit step input. **07**

Q.3 **(a)** Find the C/R for the following block diagram using block diagram reduction techniques. **07**

(b) Obtain the transfer function by using Mason's Gain formula by sketching the signal flow graph of given system. **07**

OR

Q.3 **(a)** Find C for below given system using Block diagram reduction techniques **07**

(b) For the signal flow graph shown in figure determine the transfer function. **07**

Q.4 **(a)** Discuss Routh's stability criteria for below given characteristic equation **07**
$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$

(b) A unity feedback control system has G(s) = K/ S (S+3)(S+6) . Draw the complete root locus for it. **07**

OR

Q.4 **(a)** The characteristics equation of feedback control system is $S^4+20S^3+15S^2+2S+K = 0$, Apply Routh's criterion and determine range of K for system stability. **07**

(b) Sketch the root locus for the transfer function $G(S)H(S) = K/(S+2)^3$. **07**

Q.5 **(a)** Draw Nyquist plot and comment on stability of the system with open loop transfer function **07**

$$G(S)H(S) = \frac{1}{S(S+1)(2S+1)}$$

(b) For the system having the open loop transfer function **07**

$$G(S)H(S) = \frac{10}{S(S+1)(S+10)}$$

Determine the stability of the system by plotting the Bode plot of the system.

OR

Q.5	**(a)**	Sketch the Nyquist plot of a given transfer function ,G(s)H(s)= $10/S^2$ (S+2)	**07**
	(b)	Sketch the bode plot for the system having G(s)H(s)= 20/ S (1+0.1S)	**07**

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