

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2141708

Date:19/05/2018

Subject Name:Control System

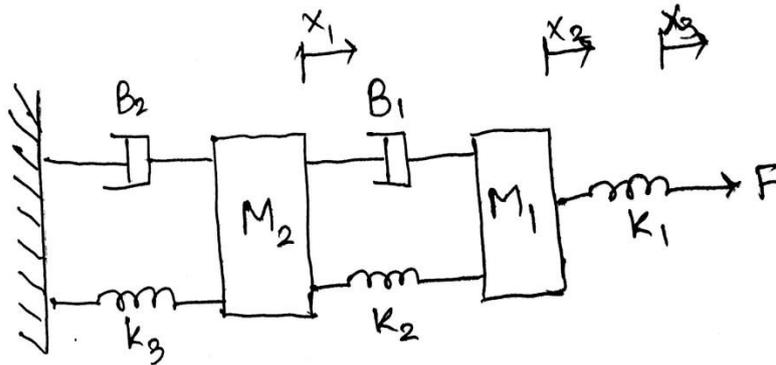
Time:10:30 AM to 01:00 PM

Total Marks: 70

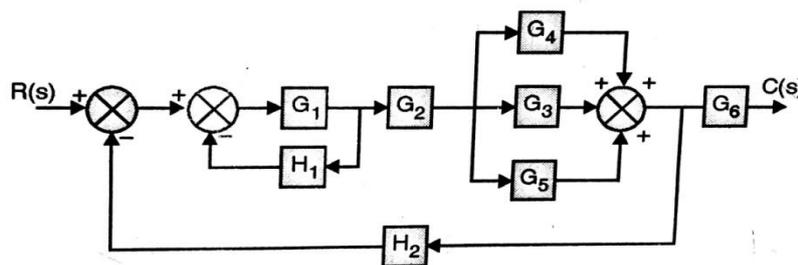
Instructions:

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

		MARKS
Q.1	(a) What are the requirements of a good control system?	03
	(b) The output of a linear system for a unit step input is given by t^2e^{-t} . Find the transfer function of the system.	04
	(c) Define transfer function. Explain relationship between impulse response and transfer function of any system. Discuss advantages and disadvantages also.	07
Q.2	(a) Explain open loop system with suitable examples.	03
	(b) Define : i) forward path and its gain ii) feedback loop and its gain iii) self loop iv) non-touching loops	04
	(c) What is force current analogous system? Which are the analogous quantities according to this method?	07
	OR	
(c)	Obtain differential equations describing the mechanical system shown in the figure and draw the electric network using force-voltage analogy.	07



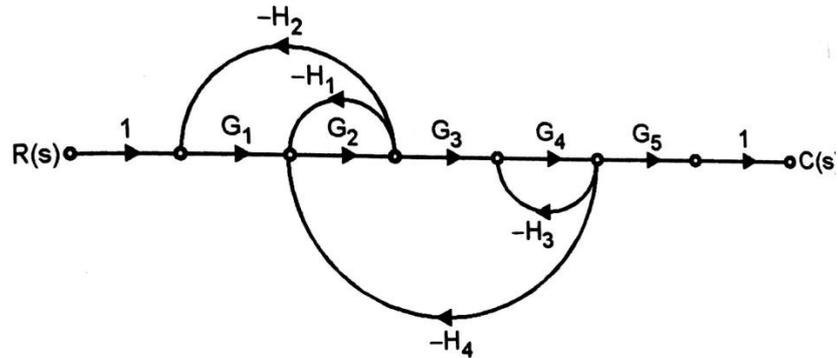
Q.3	(a) Explain how Mason's gain formula can be applied to electrical network.	03
	(b) Define and explain : i) Poles ii) Zeros iii) characteristic equation iv) order	04
	(c) Find out the overall transfer function using block diagram reduction rule	07



OR

Q.3	(a) What is the necessity of standard test signals?	03
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- (b) Explain Nyquist stability criterion 04
 (c) Using mason's gain formula find the transfer function of the following system. 07



- Q.4** (a) State the properties of state transition method. 03
 (b) Explain unit step response of first order system. 04
 (c) Draw Nyquist plot for following transfer system :- 07

$$GH(s) = \frac{1}{s^2(s+a)}$$

OR

- Q.4** (a) A series RLC circuit has $R=1\Omega$, $L=1\text{ H}$ and $C=1\text{ F}$. What is the damping ratio of the circuit? 03
 (b) Determine the stability of the system $s^3 + 6s^2 + 12s + 8 = 0$. 04
 (c) Derive the expression of delay time and Rise time for under damped second order system. 07

- Q.5** (a) State the advantages of frequency response methods? 03
 (b) Explain the usefulness of root locus diagram in the design of a feedback control system. 04

- (c) For the unity feedback control system 07
 $G(s) = \frac{10}{s(s+1)(s+5)}$. Sketch the Bode plot, determine gain and phase margin. If the margin is increased to 150% what is the new gain margin & phase margin? What is the effect on stability?

OR

- Q.5** (a) What should be values of G.M and P.M of a good system? 03
 (b) Compare Block diagram method and signal flow diagram method. 04
 (c) List all the rules to construct a root locus and explain. 07
