

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2150909

Date: 06/06/2019

Subject Name: Control System Engineering

Time: 02:30 PM TO 05:00 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) Explain transfer function and write its advantages and disadvantages.	03
	(b) Give difference between open loop and close loop control system	04
	(c) Define the following terms. (1)control system(2) plants (3)process(4)disturbance(5)controller (6)output (7)input	07
Q.2	(a) Explain in brief mass son's gain formula	03
	(b) Explain any two properties of Laplace transform	04
	(c) Obtain the overall transfer function of the system whose block diagram is given in following Figure-1 using block diagram reduction technique	07
	OR	
	(c) Obtain the transfer function C/R from the signal flow graph shown in Figure-2	07
Q.3	(a) State the advantages of frequency response method.	03
	(b) Consider characteristic equation of closed loop control system as $S^3+3KS^2+(K+2)S+4=0$ Find range of K Using R-H criterion so that system is stable.	04
	(c) Write the governing differential equations of the mechanical system shown in Figure-3 .Write analogous electrical equations based on Force-voltage analogy. Draw the corresponding circuit diagram.	07
	OR	
Q.3	(a) Explain standard test signals used in the control system.	03
	(b) Derive steady state error constants of the Type-0 system for a Ramp input	04
	(c) Derive the transfer function of armature controlled D.C. motor	07
Q.4	(a) State and explain nyquist stability criteria	03
	(b) Give comparisons between block diagram and signal flow graph in brief.	04
	(c) Draw the root locus plot for a system having open loop transfer function $G(s)H(s) = K/s(s+1)(s+3)$ Determine gain margin for K=6	07
	OR	
Q.4	(a) Define: rise time, peak over shoot and settling time	03
	(b) Explain about the time constant of first order system.	04
	(c) Explain Type 0, Type 1 and Type 2 control system. Derive equation for the steady state error of the Type 2 control system for step, ramp and parabolic input.	07
Q.5	(a) Write short note on PID controller.	03
	(b) What are the special cases of Routh's criterion? Explain in brief?	04

- (c) A unity feedback system is characterized by an open loop transfer function $G(S)=K/s(s+10)$.determine the gain K, so that the system will have a damping ratio of 0.5.for the value of K ,determine settling time, peak overshoot and time to peak overshoot for a unit step input.

07

OR

Q.5 (a) Define: Phase margin and Gain margin

03

(b) State the advantages of bode plot.

04

(c) For the given electrical system shown in the Figure-4. Determine (i) transfer function model(2)state variable model

07

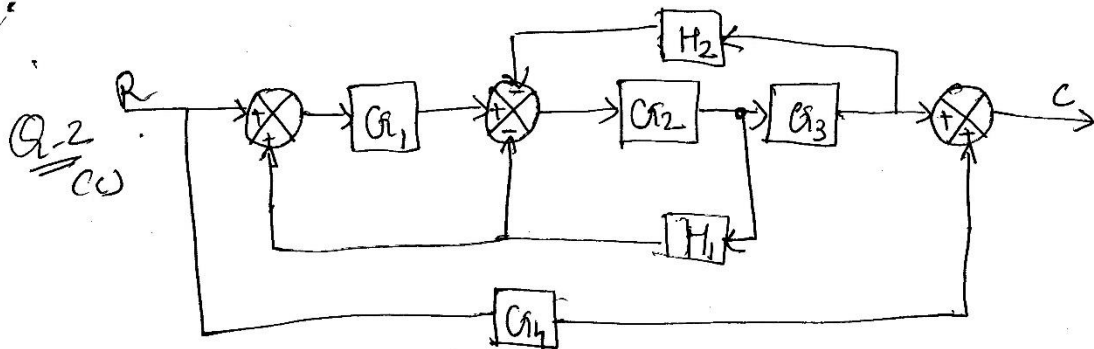


Figure-1

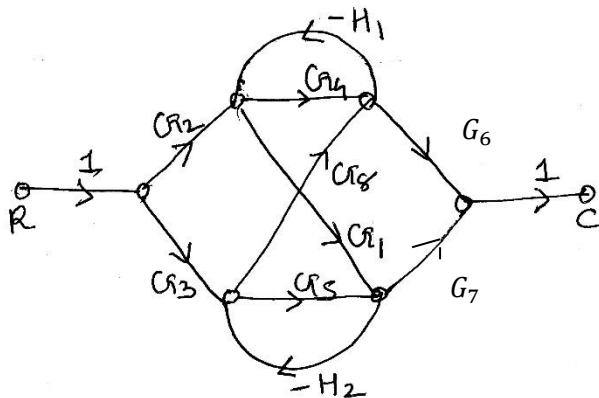


Figure-2

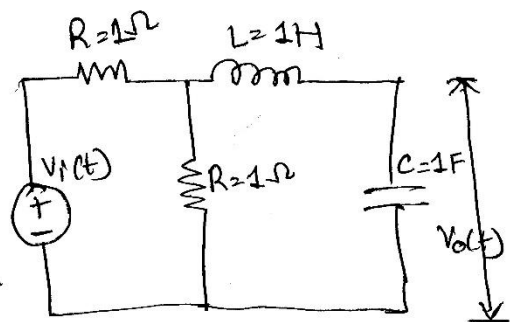


Figure-4

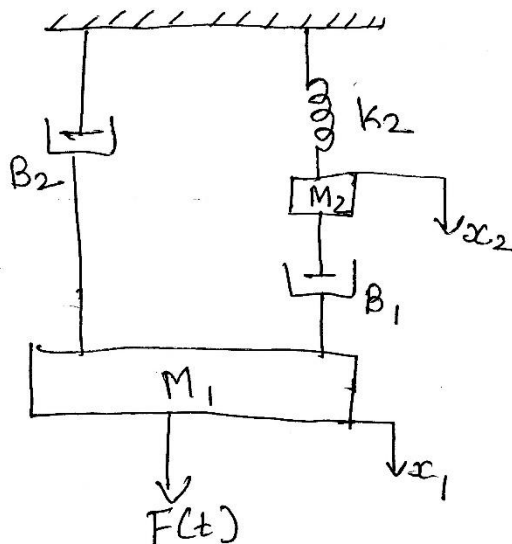


Figure-3
