

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 2151908

Date: 03/07/2023

Subject Name: Control 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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) List down basic elements of a pneumatic control system.	03
	(b) Explain linear control system. State the principle of superposition.	04
	(c) Write down analogues terms for mechanical system components as per F-V & F-I analogy.	07
Q.2	(a) Define: Disturbance, Controlled Variable, Feedback	03
	(b) Compare block diagram and signal flow graph.	04
	(c) Obtain the Transfer function C/R from the signal flow graph as shown in figure1	07

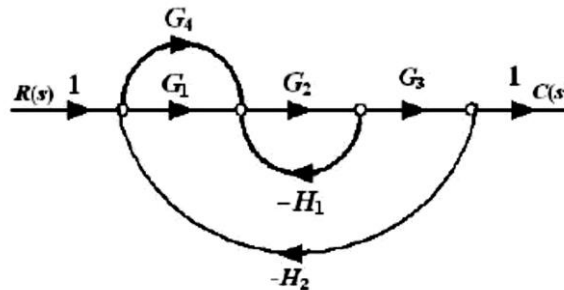


Figure 1

OR

	(c) Draw the schematic diagram of Hydraulic PID controller. Explain its working and derive its transfer function.	07
Q.3	(a) With the help of necessary diagram, explain Pneumatic nozzle- flapper amplifier.	03
	(b) What is Frequency Response? State the methods used in frequency response analysis.	04
	(c) Find out transfer function of the block diagram shown in figure 2 using block diagram reduction method.	07

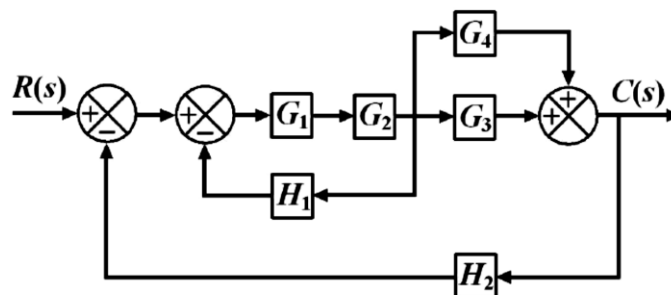


Figure 2

OR

- Q.3** (a) Discuss about gain margin and phase margin for frequency response of control system. **03**
(b) What are the merits of frequency response? **04**
(c) What are different types of standard input test signals? Explain each one of them with neat sketch. **07**

- Q.4** (a) Differentiate between hydraulic and pneumatic control systems. **03**
(b) Check stability of system whose characteristic equation is $s^3 + 8s^2 + 14s + 24 = 0$ using Hurwitz criteria. **04**
(c) Define following terms in context with the transient response specifications of second order system using neat sketch: Delay time, Rise time, Peak time, Maximum overshoot, settling time. **07**

OR

- Q.4** (a) What is FRL unit in pneumatic control system? **03**
(b) Elaborate the effect of steady state error when step input is applied to type 0 system. **04**
(c) Draw root locus for the system. **07**

$$G(s)H(s) = \frac{k}{s(s+3)(s+6)}$$

- Q.5** (a) Explain the following terms: (i) State (ii) State variables (iii) State-space. **03**
(b) Evaluate the effect of time constant on 1st order system response for unit step input. **04**
(c) Evaluate and comment on the stability for the system having characteristics equation is given as:
 $s^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$. **07**

OR

- Q.5** (a) State merits and demerits of open loop control system. **03**
(b) What are the advantages of state-space representation over conventional control-system analysis method? **04**
(c) Classify direction control valves with neat sketch. **07**
