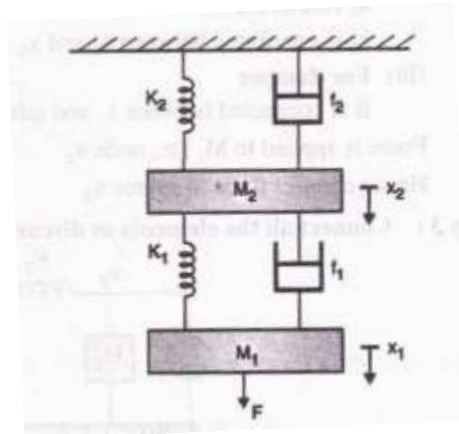


GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024****Subject Code:2151908****Date:17-12-2024****Subject Name: Control Engineering****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

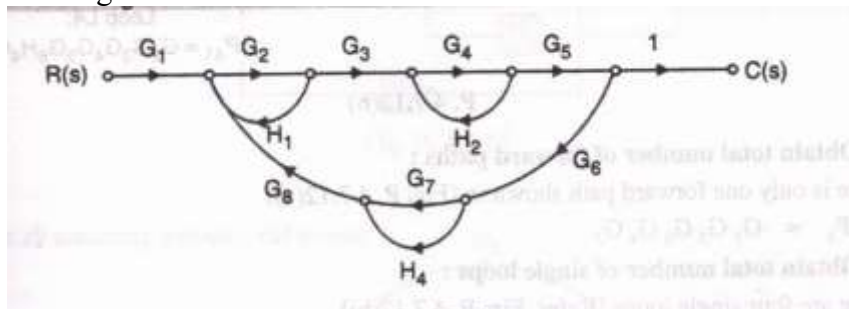
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- | | | |
|-----|---|-----------|
| (a) | Define a control system. Write requirements of a sound control system. | 03 |
| (b) | What is a Block diagram? Represent a control system by a block diagram. | 04 |
| (c) | Write down examples of an Open-loop control system and a Closed-loop control system. State their differences. | 07 |
- Q.2**
- | | | |
|-----|---|-----------|
| (a) | Explain Poles and Zeros of a Transfer function. | 03 |
| (b) | Write down Advantages and Disadvantages of Transfer function. | 04 |
| (c) | Determine the system equations for the mechanical system shown in Figure I. | 07 |

**Figure I**
OR

- (c) Explain Force-Voltage analogy and Torque-Current analogy. **07**
- Q.3**
- | | | |
|-----|--|-----------|
| (a) | Write down Properties of Signal flow Graph. | 03 |
| (b) | Compare Block diagram method with signal flow graph method. | 04 |
| (c) | Find out Transfer function for signal flow diagram as shown in Figure II using Mason's gain formula. | 07 |

**Figure II**
OR

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | State Advantages of Frequency response analysis. | 03 |
| (b) | Write comparison between Conventional control theory and Modern control theory. | 04 |

- (c) Reduce block diagram as shown in Figure III and obtain the overall transfer function. 07

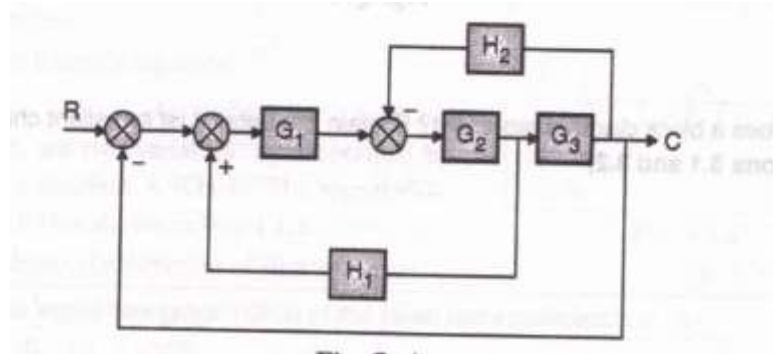


Figure III

- Q.4** (a) What do you understand by Transient and Steady state response? 03
 (b) Define the following terms : 04
 1) Delay time 2) Rise time
 3) Peak overshoot 4) Steady state error
 (c) Explain Routh's stability criterion. State Application of Routh's Criterion. 07

OR

- Q.4** (a) State Angle condition and Magnitude condition of root locus method. 03
 (b) Explain methods used for frequency response analysis. 04
 (c) Draw the root locus for the following system. 07

$$G(s) = \frac{k}{s(s+1)(s+2)}, \quad H(s) = 1$$

- Q.5** (a) State the various components of any Hydraulic circuits. 03
 (b) Obtain state model for the transfer function: 04

$$\frac{C(s)}{R(s)} = \frac{(s+2)}{(s+1)(s+3)}$$

- (c) Enlist types of Hydraulic controllers. Explain any of them. 07
- Q.5** (a) Differentiate clearly between Pneumatic and Hydraulic control systems. 03
 (b) Explain the PID control action briefly. 04
 (c) With a neat sketch explain pneumatic nozzle-flapper amplifier. 07
