

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 5 – EXAMINATION – SUMMER 2026

Subject Code: 2151908

Date: 06/06/2026

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.

- Q.1**
- | | | |
|-----|---|----|
| (a) | Write down requirements of a sound control system. | 03 |
| (b) | Define 'Control system'. Classify in brief Control systems. | 04 |
| (c) | With suitable examples discuss Open loop system and Closed loop system. State advantages of Closed loop system. | 07 |

- Q.2**
- | | | |
|-----|--|----|
| (a) | Define 'Signal flow graph'. Can we draw Signal flow graph from Block diagrams? | 03 |
| (b) | Define the term 'Transfer function'. Write down properties of Transfer function. | 04 |
| (c) | Obtain the Transfer function of the block diagram given in Figure 1 using the block diagram reduction rules. | 07 |

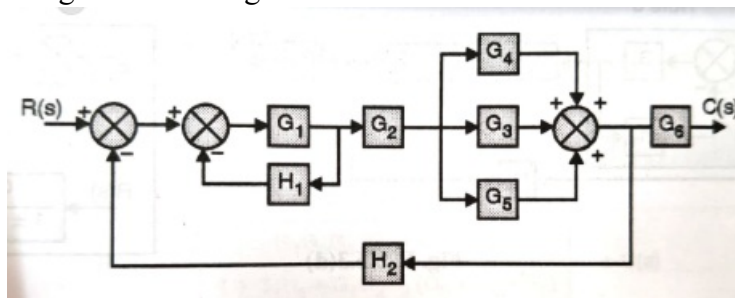


Figure 1

OR

- | | | |
|--|---|----|
| | (c) What is Block Diagram? Explain important rules for Block diagram reduction. | 07 |
|--|---|----|
- Q.3**
- | | | |
|-----|---|----|
| (a) | Explain translational mechanical and rotational mechanical systems. | 03 |
|-----|---|----|

(b) Obtain system equations for the mechanical system shown in Figure 2.

04

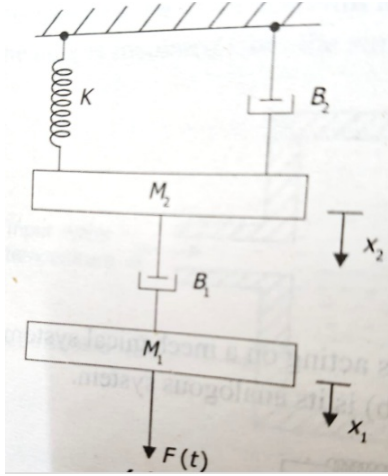


Figure 2

(c) Describe Force-Voltage analogy and Force-Current analogy as applied to electrical analogies for Mechanical systems.

07

OR

- Q.3 (a) Define the following terms : (a) Rise time (b) Delay time (c) Settling time 03
- (b) Discuss in brief Routh's stability criterion. 04
- (c) Obtain transfer function for the signal flow graph shown in Figure 3 using Mason's Gain formula. 07

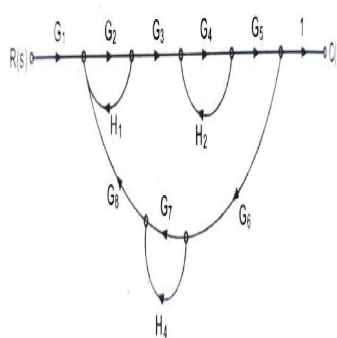


Figure 3 Signal Flow Graph

- Q.4 (a) Explain the concept of Stability and the types of stability. 03
- (b) Compare critically Modern control theory with conventional control theory. 04
- (c) Explain unit step response of first order linear time invariant systems. 07

OR

- Q.4 (a) State advantages of frequency response analysis. 03
- (b) Critically compare Hydraulic control systems with Pneumatic control systems. 04
- (c) List the basic types of control actions. Explain the PID controller briefly. 07

- Q.5** (a) What is FRL unit in Pneumatic system? **03**
(b) Explain Pneumatic nozzle-flapper amplifier. **04**
(c) A Unity feedback system has an open loop transfer function : **07**

$$G(s) = \frac{k}{s(s+2)(s+4)}$$

Sketch the root locus.

OR

- Q.5** (a) Write note on “Directional control valve”. **03**
(b) List various components used in any hydraulic circuits. **04**
(c) Draw and explain Proportional-Derivative (PD) Hydraulic controller. **07**
