REG. NO.:

SLOT: F1

VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

Programme Name & Branch	: B.Tech. (BMA/BME/BMM)
Course Code and Course Name	: **BMEE308L and Control System**
Faculty Name(s)	: Senthil Kumar S; Giriraj M; Denis Ashok S; Kalaiarassan G; Ashirbad Swain
Class Number(s)	: VL2024250103870, 3868, 3867, 3869, 3866
Date of Examination	: 18-Oct-2024
Exam Duration	: 90 minutes **Maximum Marks:** 50

General instructions:

- Answer All Questions; Open Book Examination; Graph Sheet can be used for plots.
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Course Outcomes

CO2: Develop various representations of system based on the first principles approach.

CO3: Infer the domain specifications from the time and frequency response.

CO4: Analyze the stability of closed-loop systems using different techniques.

Q. No	Question	M	CO	BL
1.	Explain the concept of modelling of an electromechanical system in the context of control systems. Provide a suitable example, including components, modelling process, and application of control strategies.	[10]	2	2
2.	In the given figure 1, determine the undamped natural frequency and damping ratio of the system in the following cases: (a) H(s) is open and (b) Connected with unity feedback.	[10]	3	3

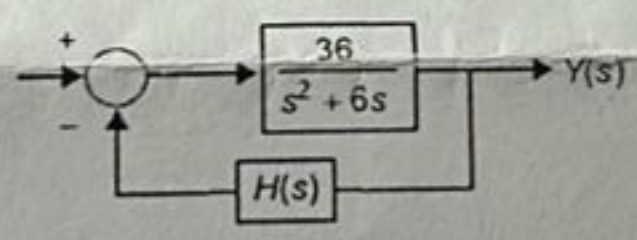

Fig. 1

3. A control system with open loop transfer function given below, indicate the type of input signal and calculate the relating constant steady state errors. [10] 3 4

(i) $G(s) = \frac{15(s+2)}{(s+3)(s+9)}$

(ii) $G(s) = \frac{30}{s(s+1)(s+6)}$

(iii) $G(s) = \frac{18}{s^2(s+2)(s+5)}$

4. Evaluate the value of K for which the system whose characteristic equation given below is stable following Routh-Hurwitz's stability criterion. [10] 4 5

$$s^3 + 3s^2 + 3s + (1 + K) = 0$$

5. A unity feedback control system has an open loop transfer function $G(s)$, [10] 4 5

$$G(s) = \frac{2K}{s(2s^2 + 8s + 26)}$$

Sketch the root locus.

***