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

Reg. Number:

Continuous Assessment Test (CAT) – 2 OCTOBER 2025

Programme	:	B.Tech - CSE (Cyber Physical Systems)	Semester	:	Fall 2025
Course Code & Course Title	:	BEEE303L – Control Systems	Class Number	:	CH2025260101802 CH2025260101801
Faculty	:	Dr. P. Balamurugan Dr. J. L. Febin Daya	Slot	:	A2+TA2
Duration	:	90 Mins	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other informat
- Use of **regular graph sheets and semi-log graph sheets** is recommended.
- Only non-programmable calculator without storage is permitted.

Course Outcomes:

CO2. Analyze the system performance in time and frequency domains.
CO3. Determine the stability of linear time invariant system in time and frequency domains

Answer all questions

	Sub Sec.	Description	Marks	CO
		A magnetic disc drive requires a motor to position a read/write head over tracks of data on a spinning disk, as shown in Figure 1. The motor and the head may be represented by the transfer function: $$G(s) = \frac{10}{s(\tau s + 1)}$$ where τ=0.001 sec. The controller takes the difference of actual and desired positions and generates an error. This error is multiplied by an amplifier K. i) What is the steady-state position error for a step change in desired input? ii) Calculate the required K in order to yield a steady-state error of 0.1 mm for a ramp input of 10 cm/s.	10	1

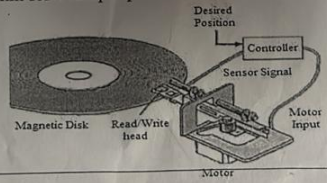
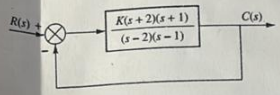


Figure 1

	For the unity feedback system whose open-loop transfer function is $G(s) = \frac{K(s+2)}{s(s-1)(s+3)}$, find the range of 'K' for closed-loop stability using Routh array.	10	1	K3
	For the system shown in Figure 2, make an accurate plot of the root locus and find the following: a. Find the break-away and break-in points b. The range of K that yields stable system. c. The range of K that yield a stable system with critically damped second-order poles.  Figure 2	15	1	K3
	Given a unity feedback system with the forward-path transfer function $G(s) = \frac{K}{(s+1)(s+3)(s+6)}$, find the range of 'K' to yield stability. Find the phase margin, gain margin for K = 10 using its frequency response.	15	2	K3

**********All the best **********