



# VIT

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

Reg. Number:

## Continuous Assessment Test (CAT) – I AUGUST 2025

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

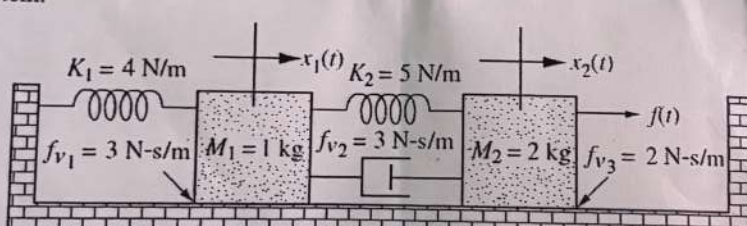
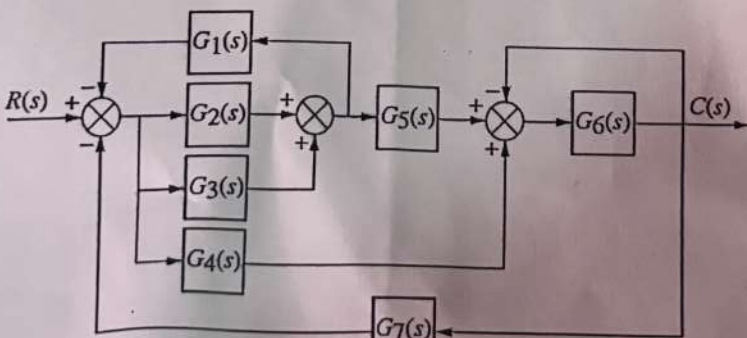
### General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

### Course Outcomes:

- CO1. Formulate mathematical models of the physical systems.  
CO2. Analyze the system performance in time and frequency domains.

Answer all questions

| Q. No | Sub Sec. | Description                                                                                                                                                                                                                                                                                                           | Marks | CO | BT Level |
|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|----------|
| 1     |          | <p>Model the system given in Fig. 1 and find the transfer function <math>X_2(s)/F(s)</math>. Draw the series voltage analogous electrical network for the given mechanical system.</p>  <p style="text-align: center;">Fig. 1</p> | 10    | 1  | K3       |
| 2     |          | <p>Reduce the block diagram and determine the transfer function <math>T(s) = C(s)/R(s)</math> of the system shown in Fig. 2.</p>  <p style="text-align: center;">Fig. 2</p>                                                       | 10    | 1  | K3       |

|   |                                                                                                                                                                                                                                                                                                                                   |    |   |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|
| 3 | <p>The model of an automatic pumping system used in nuclear power plant is represented in Fig. 3. Construct the equivalent signal flow graph and evaluate transfer function of the system using Mason's gain formula.</p> <p style="text-align: center;">Fig. 3</p>                                                               | 10 | 1 | K3 |
| 4 | <p>For the system shown in Fig. 4 determine the time response parameters for a unit step input.</p> <p style="text-align: center;">Fig. 4</p>                                                                                                                                                                                     | 10 | 2 | K3 |
| 5 | <p>Consider the translational mechanical system shown in Fig. 5. A 4 N force, is applied at <math>t = 0</math>. If <math>f_v = 1</math>, find K and M such that the response is characterized by a 4 sec settling time and a 1 sec peak time. What is the resulting peak overshoot?</p> <p style="text-align: center;">Fig. 5</p> | 10 | 2 | K3 |

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