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Vellore Institute of Technology
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SLOT: B2+TB2

REG. NO.:

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST (CAT) -II
WINTER SEMESTER 2025-2026

Program Name & Branch	: B. Tech – BMA, BME, BMM
Course Name Code	: BMEE330L
Course Name	: Control Systems
Faculty Name(s)	: Prof. Chinmaya Sahu, Prof. Ashirbad Swain, Prof. Suresh Kumar
Class Number(s)	: VL2025260502985, 2499, 2988
Date of Examination	: 16-03-2026
Maximum Marks: 50	Exam Duration: 90 mins

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes Statements:
  CO. 2: Develop various representations of system based on the first principles approach
  CO. 3: Infer the domain specifications from the time and frequency response.
  CO. 4: Analyse the stability of closed-loop systems using different techniques

Q. No	Question	M	CO	BL
1.	Applying block diagram reduction technique to find the overall transfer function of the system shown in Fig. 1	10	2	3
	Fig. 1			
2.	Using Mason's rule find the overall gain of the system shown in Fig. 2	10	2	3
	Fig 2			

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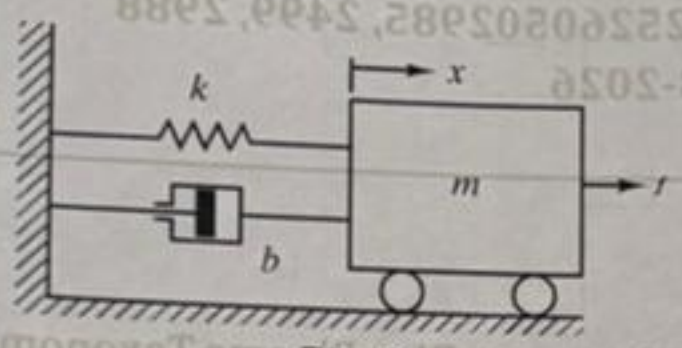
3.	For a mass spring and damper system shown in Fig. 3 obtain the expression for displacement (x) when a unit step force is applied as shown considering m = 1 kg, k = 1 N/m and b = 0.2 Ns/m.  Fig. 3 Find, damped Natural frequency, % overshoot, settling time and steady state error for the system.	10	3	3
4.	The open-loop transfer function of a system is given as $\frac{4}{s(s+3)}$. It is required to locate the poles of this transfer function at -7 and $-4 \pm 3j$ by a by using a PID controller. Calculate the values of controller gains so as to achieve the objective.	10	3	4
5.	Consider a unity feedback system with open loop transfer function $\frac{4}{s(s^4+4s^3+8s^2+8s+7)}$. Find the state of stability using Routh-Hurwitz criterion.	10	4	4

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