BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH/IMSC **SEMESTER: II**
BRANCH: MECH/CIVIL/PROD/CHEMICAL/BIOTECH/PHYSICS **SESSION: SP/2025**

SUBJECT: ME24101 BASICS OF MECHANICAL ENGINEERING

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1	A truss is supported by a pinned, roller, and fixed support, each crucial for stability. Explain their roles in force distribution. Now, if support is faulty—like a pinned support allowing slight horizontal movement or a roller developing friction—how would this impact stability and load distribution? Could such imperfections shift the truss from determinate to indeterminate? If so, explain why and its consequences.	[5]	CO1, CO4	3
Q.2	Consider an elemental block subject to uniaxial tension Fig. 1. Derive the most simplified approximate expressions for the change of volume per unit volume due to this loading.	[5]	CO1, CO2	2

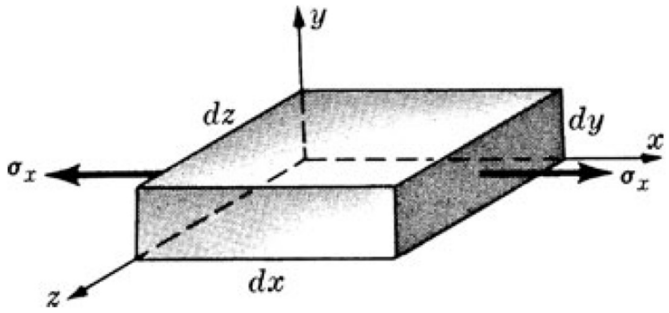

Fig. 1

Q.3	A bar slides on a vertical post and is hinged to block A that is moving to the right with a constant velocity V_C. See Fig. 2. Find the most simplified expression of the angular velocity of the bar.	[5]	CO1, CO3	2

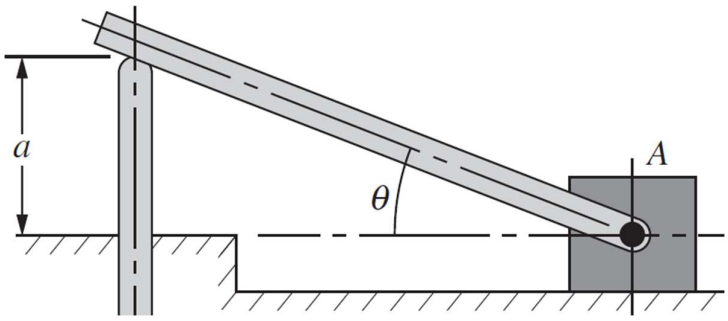

Fig. 2

PTO

Q.4 A block, assumed to be a particle and weighing 40 N, rests on a plane which can turn about the y axis, see Fig. 3. The length of the cord l is 1.2 m. What is the tension in the cord when the angular velocity of the plane and block is 10 rev/min? [5] CO1, CO3 2

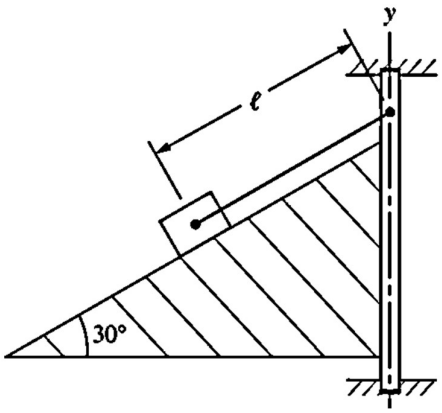

Fig. 3

Q.5 Friction is often seen as a resistive force, but it is also essential for motion. Explain the laws of friction in detail and justify why friction is both beneficial and limiting in mechanical systems. Provide at least two real-life examples where friction plays a crucial role in enabling motion rather than resisting it. [5] CO1, CO4 3

::::::27/02/2025::::::M