

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(MID SEMESTER EXAMINATION)

CLASS: BTECH  
BRANCH: ECE/CSE/AI ML/EEE

SEMESTER: I/ADD  
SESSION: MO/2024

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

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|--|-----|---------|---------|
| Q.1 According to your syllabus, all the truss problems you solve are related to plane trusses. However, in real-world scenarios, trusses are often not limited to two dimensions. Do you think the concepts you've learned for plane trusses will help you solve real-world truss problems? Justify your answer. In your response, include the key assumptions of plane truss analysis, and name and draw three common types of trusses. | [5] | CO<br>4 | BL<br>4 |
| Q.2 A tensile load of 40 kN is acting on a rod of diameter 40 mm and of length 4 m. A bore of diameter 20 mm is made centrally on the rod. To what length the rod should be bored so that the total extension will increase 30% under the same tensile load. Take $E = 2 \times 10^5 \text{ N/mm}^2$ .   | [5] | 2,3     | 3       |
| Q.3 An overhead door is guided by wheels at A and B that roll in horizontal and vertical tracks as shown in Fig. 1. Knowing that when $\theta = 40^\circ$ the velocity of wheel B is 1.5 m/s upward, determine the angular velocity of the door, the velocity of end D of the door.  | [5] | 2,3     | 3       |

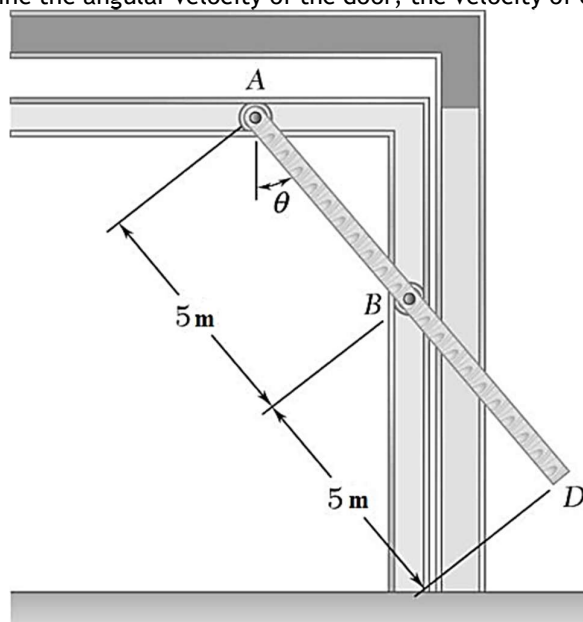


Fig. 1

PTO

- Q.4 Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal (frictionless and massless) pulley as shown in Fig. 2. With what acceleration does the heavier body come down and what is the tension in the string? [5] 2,3 2

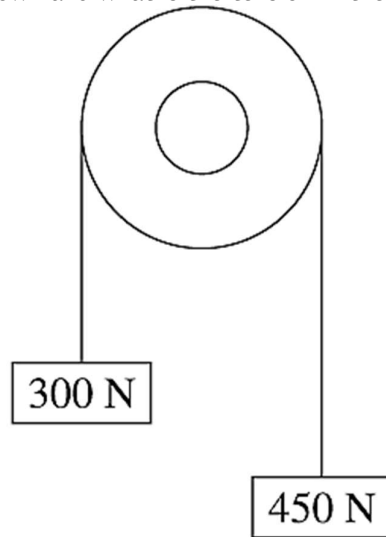


Fig. 2

- Q.5 A block weighing 500 N just starts moving down a rough inclined plane supported by a force of 200 N acting parallel to the plane and it is at the point of moving up the plane when pulled by a force of 300 N parallel to the plane. Find the inclination of the plane and the coefficient of friction between the inclined plane and the weight. [5] 2,3 1

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