Course Code: ESC106A
Course Title: Construction Materials and Engineering Mechanics

Lecture No. 50:
Problems on Ladder Friction

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Lecture Intended Learning Outcomes

At the end of this lecture, students will be able to:

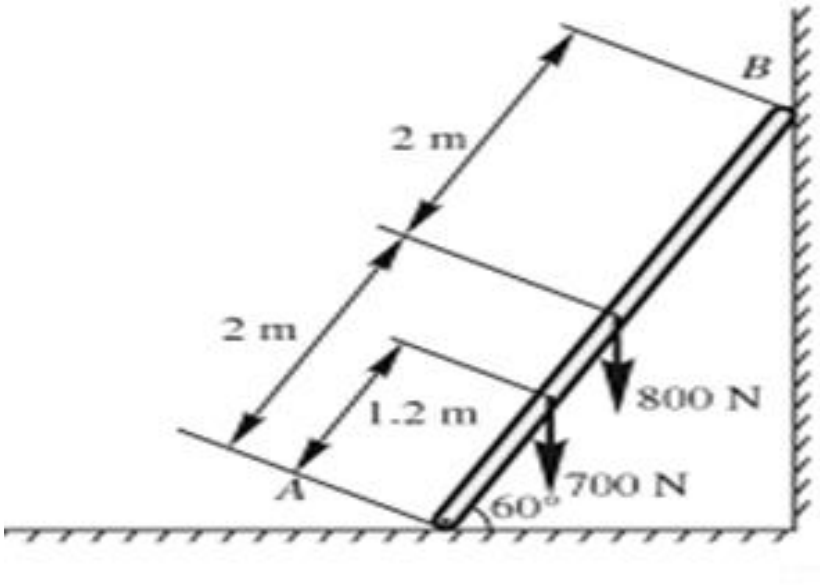
- Draw Free Body diagrams of Ladder in the given problems
- Evaluate frictional forces or find the height upto which a person can ascend safely or find the force needed to be applied at the floor level to hold the ladder in equilibrium

Contents

- Numerical problems on Ladder friction

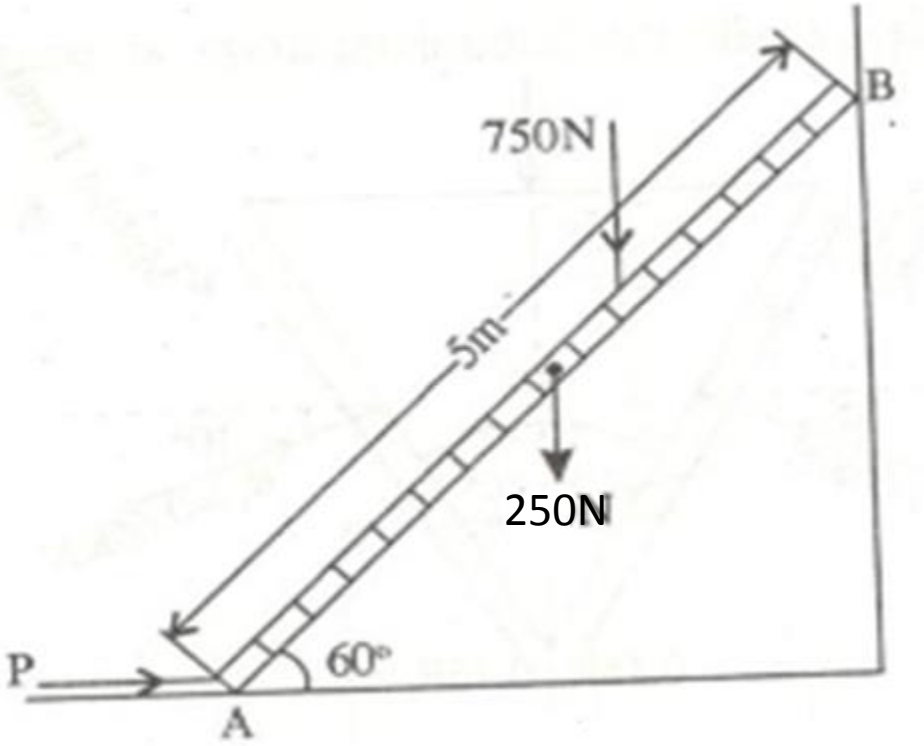
Ladder Friction: Problem 1

A ladder, 4m long leans against a smooth vertical wall at an angle of 60˚ with the horizontal as shown in the fig. The weight of the ladder is 800N.When a person weighing 700N stands at 1.2m from the bottom of the ladder, the is just about to slide. Calculate the coefficient of friction between the ladder and the floor.



Ladder Friction: Problem 2

Example: A ladder weighing 250N and length 5m is placed against a vertical wall as shown. The coefficient of friction between ladder and wall is 0.2 and between ladder and floor is 0.3. The ladder has to support a man weighing 750N at a distance of 1m along the ladder from wall. Calculate the minimum horizontal force to be applied at A to prevent the slip



Ladder Friction: Problem 3

Example: A uniform ladder of weight 200N of length 4.5m rests on a horizontal ground and leans on a rough vertical wall. The co-efficient of friction between the ladder and floor is 0.4 and between ladder and vertical wall is 0.2. When a weight of 900N is placed on the ladder at a distance of 1.25m from the top of the ladder is at the point of sliding. Find the angle made by the ladder with horizontal, if no horizontal load applied at the foot of the ladder to prevent slip.

Summary

- Friction is the force resisting the relative motion of solid surfaces, fluid layers and material elements sliding against each other
- Based on the concept of ladder friction the problems are solved