

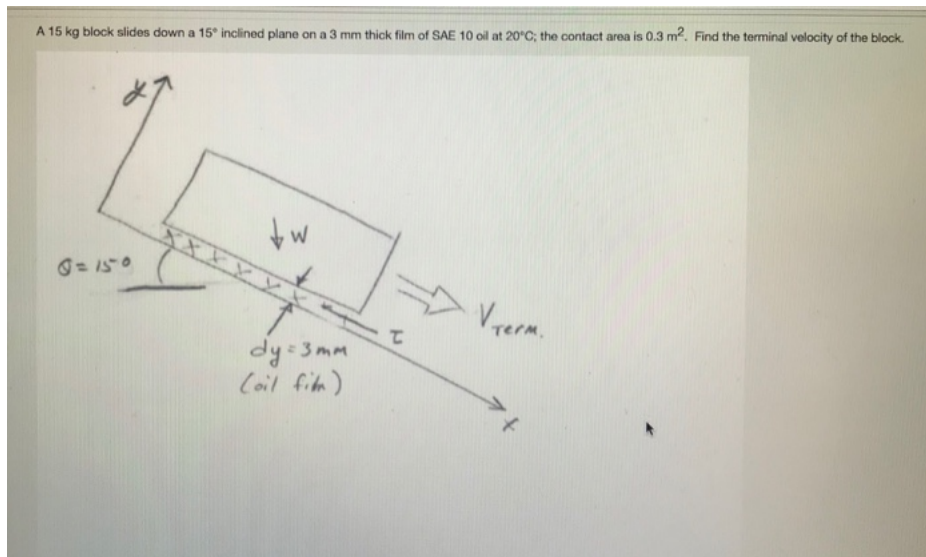


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**Question: A 15 kg block slides down a 1 inclined plane on a 3 mm thick fi...**

**QUESTION 4**

The shear stress from the oil counteracts the weight. What is this force and its direction?

- $\tau A$  in X  
  $-\tau A$  in X  
  $-\tau A$  in Y  
 0

**QUESTION 5**

For this problem- The  $\Delta V$  in the shear stress equation  $\tau = \mu \Delta V / \Delta x$  represents

- The velocity of the block in the y-direction.  
 The increase in velocity since the block was released.  
 The change in volume to the fluid film.  
 The velocity difference between the plane and the block. Since the plane is not moving it really is the velocity of the block.

**QUESTION 6**

What is the terminal velocity of the block? Report answer in the (m/s) units with one decimal place.

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## Expert Answer



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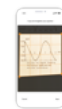
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mass of block,  $m = 15 \text{ kg}$ , Weight  $= W = mg = 15 \times 9.81$   
 $W = 147.15 \text{ N}$   
 $\theta = \text{angle of contact, } = 15^\circ$   
 Thickness of film,  $t = dy = 3 \text{ mm} = 3 \times 10^{-3} \text{ m}$   
 Oil: SAE 10 at  $20^\circ\text{C}$   
 Area of plate,  $A = 0.3 \text{ m}^2$   
 Now, from engineering oil catalogue  
 Viscosity of a SAE 10 oil,  
 $\mu = 0.079 \frac{\text{N}\cdot\text{s}}{\text{m}^2}$

Now, since block is moving force on block in direction of motion is equal to force in opposite direction.  
 Force in direction of motion  
 $= \text{Component of weight of block}$   
 $= W \sin \theta = 147.15 \times \sin 15^\circ = 38.09 \text{ N} \dots \textcircled{1}$

Force against the direction = frictional resistance between block and inclined plane.  
 $= \tau \times \text{Area of contact}$   
 $= \mu \frac{\Delta v}{\Delta x} \times 0.3 \dots \textcircled{2}$

$\therefore$  Equating equations  $\textcircled{1}$  and  $\textcircled{2}$   
 $38.09 = 0.079 \times \frac{\Delta v}{3 \times 10^{-3}} \times 0.3$

$\Delta v = 4.821 \text{ m/sec}$

**Question 4**  
 Shear stress from the oil counteracts the weights  
 What is this force and its direction?  
 $\rightarrow -\tau \cdot A$  in X (Option 2)

**Question 5**  
 $\Delta v$  represents in  $\tau = \mu \frac{\Delta v}{\Delta x}$ ,  
 velocity difference between the plane and block  
 Since plane is not moving it really the velocity of the block. (Option 4)

**Question 6**  
 Terminal velocity =  $4.8 \text{ m/sec}$

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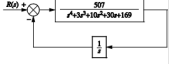
Q: A 15 kg block slides down a 1 inclined plane on a 3 mm thick film of SAE 10 oil at 20 C, the contact area is 0.3 m<sup>2</sup>. Find the terminal velocity of the block

A: [See answer](#) 100% (1 rating)

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Problem 2. Using the Routh-Hurwitz criterion, tell how many closed-loop

**Problem 2.** Using the Routh-Hurwitz criterion, tell how many closed-loop poles of the system shown in the below figure lie in the left half-plane, in the right half-plane, and on the imaginary axis.



[See answer](#)

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Q: A 15 kg block slides down a 15° inclined plane on a 3 mm thick film of SAE 10 oil at 20 degree C, the contact area is 0.3 m<sup>2</sup>. Find the terminal velocity of the block.

A: [See answer](#)

Q: Sliding Down an Inclined Surface Problem-Continue 4c. An 18-kg slab slides down a 15° inclined plane on a 3-mm-thick film of SAE 10W oil at 20°C (viscosity-8.14 x 10<sup>2</sup> N-s/m<sup>2</sup>); the contact area is 0.3 m<sup>2</sup>. Calculate the terminal velocity in m/s of the slab. (Hint: Use the diagram below to show all your work). 0- 15°

A: [See answer](#) 100% (2 ratings)

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