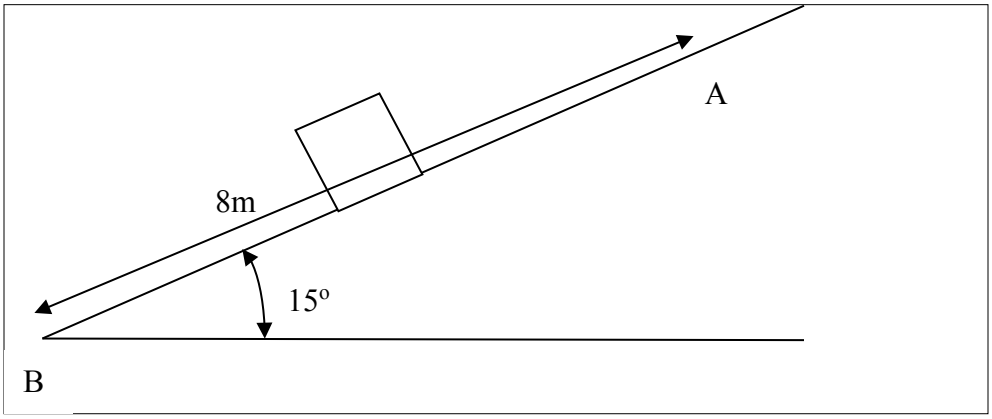
TOPIC

Engineering Mechanics (Statics and Dynamics) – Section VII – Question 11



QUESTION

A 40 kg box falls down an incline of 15°. The box is pushed down the incline with an initial velocity of 5 m/s. If the coefficient of friction is 0.3, the velocity in m/s at the bottom of the incline most nearly is

(A) 4.488
(B) 5.000
(C) 5.463
(D) 20.15

HINT

Equate the work done on the box and the change in the kinetic energy.

SOLUTION

The weight of 40 kg has two components. The component perpendicular to the incline is

$$R = (40)(9.81)(cos\,15°)$$
$$= 379.0N$$

So the friction force created against the motion along the incline is

$$=\mu R$$
$$= (0.3)(379)$$
$$= 113.7N$$

The work done on the box then is

$$U = FS$$
$$= [40(9.81)\,sin\,15° - 113.7]8$$
$$= -97.11J$$

The change in the kinetic energy is

$$\Delta T = \frac{1}{2}(40)(v^2 - 5^2)$$
$$= 20(v^2 - 5^2)$$

Equating the two energies gives

$$-97.11 = 20(v^2 - 5^2)$$

$$v = 4.488\text{m/s}$$

ANSWER

(A)

CONTRIBUTOR

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