Question 3

A particle of mass 5 kg is on a rough horizontal plane. The particle is acted upon up by a force of T newtons acting at an angle of 60^0 to the plane. A frictional force of $\frac{49\sqrt{3}}{3}$ newtons acting parallel to the plane, opposes the motion. Then if

A. $T=\frac{98\sqrt{3}+30}{3}$ the particle moves along the plane with an acceleration of $1\ \text{ms}^{-2}$.

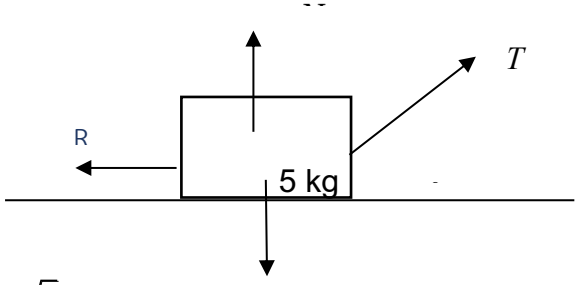
B. $T=\frac{98\sqrt{3}-30}{3}$ the particle moves along the plane with an acceleration of $1\ \text{ms}^{-2}$.

C. $T=\frac{98\sqrt{3}+60}{3}$ the particle moves along the plane with an acceleration of $2\ \text{ms}^{-2}$.

D. $T=\frac{98\sqrt{3}-60}{3}$ the particle moves along the plane with an acceleration of $2\ \text{ms}^{-2}$.

E. $T<\frac{98\sqrt{3}}{3}$ the particle does not move.

ANSWER E



The resistance force $R=\frac{49\sqrt{3}}{3}$

Resolving horizontally around the 5 kg mass $(1)\ T\cos\left(60^0\right)-R=5a$

Now $(1)\ a=0$, $T\cos\left(60^0\right)-R=0$, $T\times\frac{1}{2}=\frac{49\sqrt{3}}{3}\Rightarrow T=\frac{98\sqrt{3}}{3}$ but

Resolving vertically around the 5 kg mass $(2)\ N+T\sin\left(60^0\right)-5g=0$

Now if $N=0$ then $T\sin\left(60^0\right)-5g=0$, $T=\frac{5g}{\sin\left(60^0\right)}=\frac{49}{\frac{\sqrt{3}}{2}}=\frac{98}{\sqrt{3}}=\frac{98\sqrt{3}}{3}$

therefore when $T\geq\frac{98\sqrt{3}}{3}$, $N\leq 0$ the particle is no longer on the plane.

A. **B**. **C**. and **D**. are false, only **E**. is true, when $T<\frac{98\sqrt{3}}{3}$ the particle does not move.

