



A uniform cylinder with a rough surface and of radius a is fixed with its axis horizontal. Two identical uniform rods AB and BC , each of weight W and length $2a$, are rigidly joined at B with AB perpendicular to BC . The rods rest on the cylinder in a vertical plane perpendicular to the axis of the cylinder with AB at an angle θ to the horizontal. D and E are the midpoints of AB and BC respectively and also the points of contact of the rods with the cylinder (see diagram). The rods are about to slip in a clockwise direction. The coefficient of friction between each rod and the cylinder is μ .

The normal reaction between AB and the cylinder is R and the normal reaction between BC and the cylinder is N .

(a) Find the ratio $R : N$ in terms of μ . [6]

(b) Given that $\mu = \frac{1}{3}$, find the value of $\tan \theta$. [3]