A cylinder of mass M_C and sphere of mass M_S are placed at points A and B of two inclines, respectively. (See Figure). If they roll on the incline without slipping such that their accelerations are the same, then the ratio $\frac{\sin\theta_C}{\sin\theta_S}$ is :

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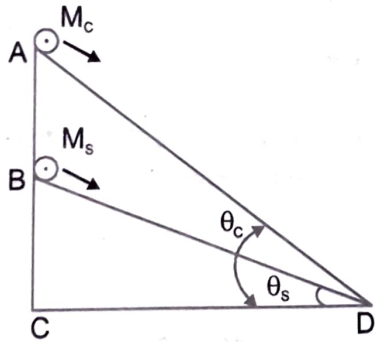

(A) $\sqrt{\frac{8}{7}}$

(B) $\sqrt{\frac{15}{14}}$

(C) $\frac{8}{7}$

(D) $\frac{15}{14}$

Solution

Correct option is
D)

$$a = \frac{g\sin\theta}{1 + \frac{k^2}{r^2}}$$

Substituting k for cylinder as $\frac{1}{\sqrt{2}}r$ and for sphere as $\sqrt{\frac{2}{5}}r$ we get

The acceleration of a cylinder rolling down an incline is $a_c = \frac{2}{3}g\sin\theta_c$

Similarly, for sphere, $a_s = \frac{5}{7}g\sin\theta_s$

Since, the two accelerations are equal,

$$\frac{\sin\theta_c}{\sin\theta_s} = \frac{15}{14}$$