Re: An IITJEE problem

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2006−04/msg02372.html

- *From*: "N:dlzc D:aol T:com \(dlzc\)" <N: dlzc1 D:cox T:net@xxxxxxxxxx>
- *Date*: Fri, 28 Apr 2006 06:23:41 −0700

Dear mL:

"mL" <mL.beyond@xxxxxxxxxxxxx> wrote in message
news:Uvl4g.54699$d5.209196@xxxxxxxxxxxxxxxxx

> N:dlzc D:aol T:com (dlzc):
>
> > Dear Nishu:
> >
> > "Nishu" <amitk_dni@xxxxxxxxxxx> wrote in message
> > news:1146152710.843745.302370@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
> >
> > > I have a SHM problem.
> >
> > "Simple Harmonic Motion"
> >
> > > A rod of length L is placed on two circular dics.
> > > The co−efficient of friction between rod and disks
> > > is k. The rod is displaced by a small distance x.
> > > Determine the time period of the oscillations.
> > >
> > > _____
> > > O O <−−−−disks
> > > <−−−−−−−−−−−−−− L −−−−−−−−−−−−−−−−>
> > >
> > > The answer is t = 2??(L/2kg) [g− acc due to gravity)
> > > But I want the solution.
> >
> > The problem setup is lacking much.
>
> Try this figure:
>
> ==========
> (o) L (o)

A B

> I assume the disks are acting like wheels, so there would be no SHM.

> If the wheels, A and B, are *counter rotating* (driven at the same angular speed) the rod will move (slide) to and fro.

Thanks mL.. Counter rotating with A rotating clockwise, and B rotating counterclockwise. L is given as the length of the rod. The distance between A and B needs to be greater than x (for any x) and less than L.

> Your formula gets trashed if you do not use ASCII. Is this t = 2 . pi . sqrt(L / (2 . k . g)) ?

> Seems to be correct.

The period of oscillation is a function of wheel speed. So any result will have to be expressed in terms of that. From the result given above, it looks like it might be 1 revolution per second (2 . pi radians).

Define the midpoint a, to be at L/2. Assume the member is homogeneous.
Define the separation between wheel centers as d, knowing that it will likely fall out of the result...
Define a mass per unit length of m_l.

Look at the diagram, and note that the rod does not spin in the plane of the page. So the sum of the moments (force times distances) about each of the two points must equal zero.
The normal force at B will be (given x positive to the right):

The normal force at A will be:

I'll fill in the blanks after work...

David A. Smith

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