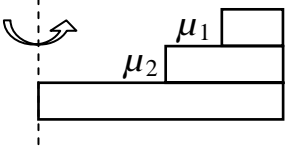


Physics Problems May-2010

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- Q1. In the figure shown the three blocks have same density and cross-section area. Their lengths are in a Geometric Progression of ratio 2. The system is rotated with various constant angular velocities about a vertical axis passing through an edge of the longest block, as shown in the figure. For a particular angular velocity it is observed that both the top blocks start slipping simultaneously, relative to their bearing surfaces. Find the ratio μ_1/μ_2 , where μ_1 & μ_2 are the coefficients of friction between the first-second & second-third blocks from the top.
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- Q2. A uniform chain of mass m & length l is kept as a heap on a horizontal surface. One end of the chain is pulled horizontally by applying a constant force F_0 . Find the law $x(t)$ for this end.
- Q3. A tall, fixed cylindrical tank of base area A has a small orifice of area a at the bottom. At a certain moment of time a tap starts filling water in this tank at a volume flow rate of β . Find the height of the water level h , as a function of time t . Find the maximum possible value of h . Consider all flows to be steady & laminar.
- Q4. A cylinder piston arrangement has a certain mass of air trapped in it at a pressure P_1 . A small soap bubble of radius r exists in the cylinder. Find the new pressure required in the cylinder to shrink the radius of the bubble by a factor of η . Assume isothermal conditions and that the surface tension of the soap solution is σ .