



Theoretical Mechanics, Lab 14: DYN VIRT DISP GEN EQN

Principle of virtual displacements

General Equation of Dynamics (D'lambert-Lagrange)

Principle of virtual displacements

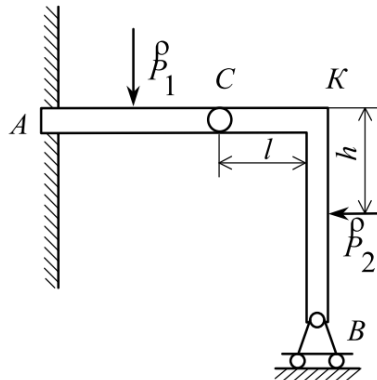


R. O.	Eqn #	Equations	Applications	Extra Info
System	1	<ol style="list-style-type: none">1. $\sum \delta A = 0$, where A is a virtual work2. $\sum W = 0$; $W = \vec{F} \cdot \vec{v} = \vec{F}v\cos(\vec{F}\vec{v})$, where W is power, v - virtual velocity	To find <i>one</i> force or reaction force.	<ul style="list-style-type: none">• Virtual work has infinitesimal displacements.• System must be in static each time.

Task 1 (mine)

The platform structure consists of two frames connected by a rotation joint C . The left end of the frame AC is rigidly fixed into the wall. The lower end of CB is supported by cylindrical movable support B .

Determine the vertical support reaction A under the forces P_1 P_2 .

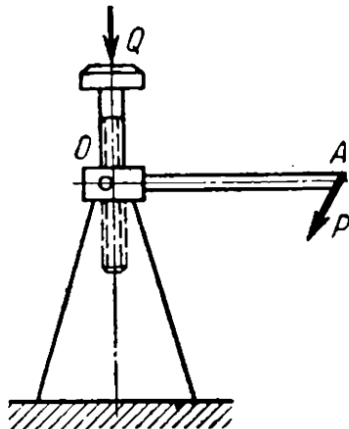


Task 2 (yours): M (rus) 46.1

A weight Q is lifted by means of a screw jack which is set in motion by a handle $OA = 0.6$. A force $P = 160$ is applied perpendicularly to the handle.

Determine the magnitude of the weight Q , if the pitch of the screw thread is $h = 0.012$.

Answer: $Q = 52200 \text{ N}$



General Equation of Dynamics



R. O.	Eqn #	Equations	Applications	Extra Info
System	1 in cartesian, n in generalized coordinates	<ul style="list-style-type: none">• $\sum \delta A + \sum \delta A^\Phi = 0$, where A is a virtual work• $\sum W + \sum W^\Phi = 0$, where W is a power	To find accelerations, motion equations	

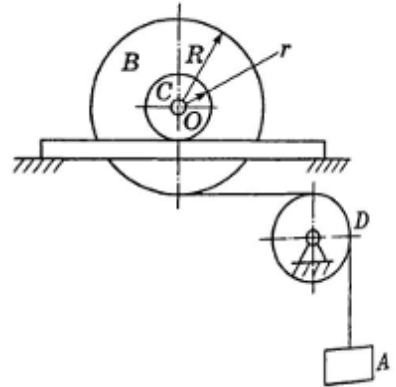
Task 3 (mine)

A load A of weight P moves down on a weightless inextensible thread which first runs over a fixed weightless pulley D and the coils on a sheave B , thus forcing the shaft C to roll without sliding along a horizontal rail.

The sheave B of radius R is mounted tightly on the shaft C of radius R : the total weight of the sheave B and the shaft C is Q .

The axis O is perpendicular to the plane of the drawing and the radius of gyration relative to O is ρ .

Find the acceleration of the load A .

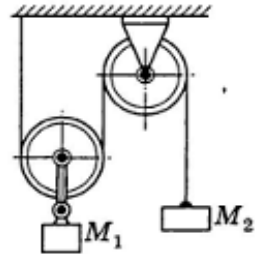


Task 4 (yours): M (rus) 47.5

To the system of blocks shown in the figure are suspended weights $M_1 = 10 \text{ kg}$ and $M_2 = 8$.

Determine the acceleration a_2 of the weight M_2 and the tension of the thread, neglecting the masses of the blocks.

Answer: $a_2 = 2.9 \frac{\text{m}}{\text{s}^2}$, $T = 56 \text{ N}$



Deserve "A" grade!

– Oleg Bulichev

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📍 @Lupasic

🏢 Room 105 (Underground robotics lab)