TM Homework 8

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Link back to GitHub

1 Task 1

1.1 Task description

Task 1 (Coding)

A mechanical system under the gravity force moves from the rest. Define the velocity of object *A* if it travels distance *s* from the rest. The masses of the non-deformable ropes are ignored. Neglect the masses of links *FK*, *KC* and the piston *K*.
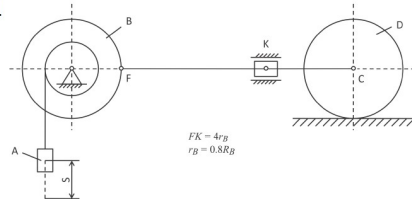The task is to:

1. make a plot $v_A(s)$;

2. What will change if we omit the last sentence (Neglect ...). (Explain it and show on equations). Why Yablonskii made these constraints?

Needed variables:
$m_A = 1$, $m_B = 3$, $m_D = 20$ (kg);
$R_B = 20$, $R_D = 20$, $i_{Bx} = 18$ (cm), i_{Bx} – radii of gyration of the body;
$\psi = 0.6$ (cm), where ψ is rolling friction.

$FK = 4r_B$
$r_B = 0.8R_B$

Task 1
(Yablonskii (eng) D6)

1.2 Solution

You may look HW8.1 from Leonid Novikov. If I do the homework, most probably it will be something like what he did.

1.3 Answers

<mark>HIGHLIGHTED ANSWERS ARE HERE</mark>

2 Task 2

2.1 Task description

Task 2 (Coding)
System description

You have a a cart pole. Body 1 is a slider, mass m_1, it moves without friction.

AB is a massless rod with length l. Body 2 with mass m_2 is connected to AB in point B.

It's a 2 DoF system. You should take x and ϕ as a representation of this system. The origin of each coordinate should be the same as on the picture.

Initial conditions:

1. $x = 0$, $\phi = 10°$, $\dot{x} = 0$, $\dot{\phi} = 0$, $t = 0$;
2. $x = 0.5$, $\phi = 45°$, $\dot{x} = 0$, $\dot{\phi} = 0$, $t = 0$;
3. $x = 0.5$, $\phi = -135°$, $\dot{x} = 0$, $\dot{\phi} = 0$, $t = 0$;

Parameters: $m_1 = 5\,kg$, $m_2 = 1\,kg$, $l = 1\,m$.
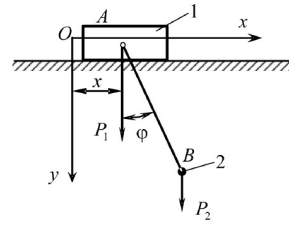
Task 2

Task 2 (Coding)
Tasks description

You should solve this problem using **Euler-Lagrange** method;

Tasks

1. To derive a differential equation of the motion, using **Euler-Lagrange** approach.
2. To create plots $x(t)$, $\phi(t)$, $\dot{x}(t)$, $\dot{\phi}(t)$.
3. To make a simulation of this system. Show velocities and accelerations for 1, 2 bodies (coding approach).
4. Compare the obtained results from previous lab (*Newton-Euler* and *Model-oriented design*).

2.2 Solution

It is not so interesting to solve. Let's move to the big homework 2.

By the way, you may see the video that explains the Euler-Lagrange method. Imagine that I rewrite the formulas from there to this file...

2.3 Answers

HIGHLIGHTED ANSWERS ARE HERE

3 MEME

Я немного тоже, поэтому потрачу это время на подготовку к файналу.