Robotics
Problem Sheet 3

Andreas Birk

Notes

The homework serves as preparation for the exams. It is strongly recommended that you solve them before the given deadline - but you do not need to hand them in. Feel free to work on the problems as a group - this is even recommended.

1 Problem

Given a DC-motor with

- no-load speed N_0: 6,000 rpm
- stall torque T_s: 0.5 gr·cm

What is the maximum mechanical power of the motor (in Watt)?

2 Problem

Given a spur gear train with 3 axes a_1 to a_3. On each axis a_i is a gear or two gears $g_{i.x}, x \in \{a, b\}$ with following numbers of teeth

- $g_{1.a}$: 10
- $g_{2.a}$: 20
- $g_{2.b}$: 50
- $g_{3.a}$: 100

Gear $g_{1.a}$ drives $g_{2.a}$, $g_{2.b}$ drives $g_{3.a}$. Given input speed or torque on a_1 calculate the according output on a_3

- input torque a_1: 10 Nm; output torque a_3?
- input speed a_1: 100 rpm; output speed a_3?

3 Problem

Given

1. a worm gear G_w with
    - $z_w = 100$ teeth on the worm wheel
2. a planetary gear G_p with
    - 4 planet gears
    - $z_p = 50$ teeth on each planet
    - $z_i = 200$ teeth on the internal gear
    - $z_s = 10$ teeth on the sun

What is the gear ratio of G_w, respectively of G_p?