

Description of Problem:

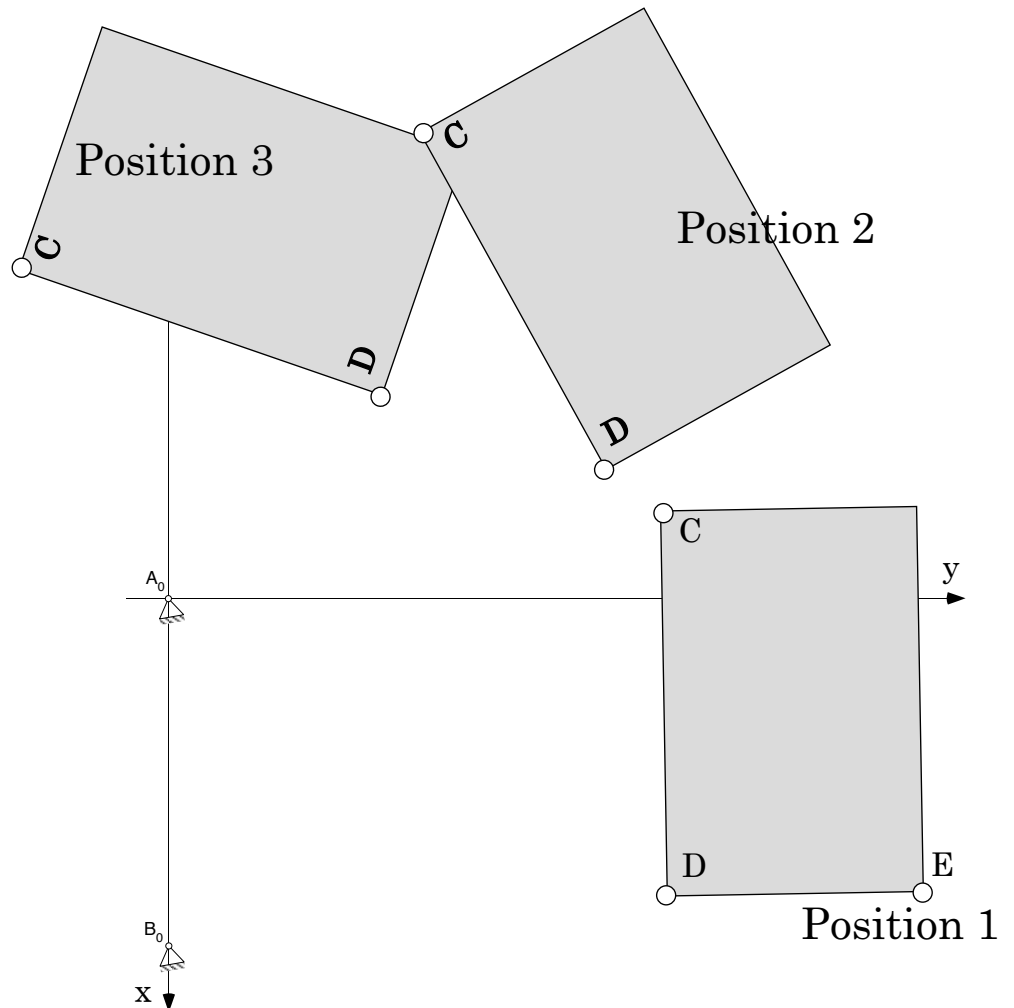
Package Transport

System-Input: Crank motion

System-Output: Package movement

The figure shows three positions of a package with a line that have points C and D. This package (this line) should be driven by a mechanism, where CD is a coupler line of a rigid coupler ACDB, where A and B are hinge points).

The crank (input) A_0A drives the mechanism and moves the line CD. It has a rotational speed of 100 Rev/min. The package has a mass of 60 kg, homogeneous distribution, lengths $(CD) = 50$ cm, $(DE) = 34$ cm.



Solve: <proposed credit points>

- 1) <4> Select a type of mechanism to drive the package meeting the requirements
- 2) <28> Find the corresponding parameters of the mechanism
 - a) by a numerical solution (using any Math programs),
 - b) verify the results by a graphical method (or opposite);
 - c) with the results check all the requirements;
 - d) show the errors of the solution, check Grashof criteria.
- 3) <6> Derive the equations of the coupler points C and D as function of the crank angle φ and plot it (path of coupler).
- 4) <6> Find the functions for toggle angles, transmission angle, linear velocity of C and D, etc. and plot it.
- 5) <6> Find the function of the crank torque M_C as function of the crank angle φ using the Jourdain's principle (balance of power) for a gravitational force of the package. Assume that no further forces and torques exist.

Basic Restrictions:

1) Write the following header on the top of the report and all the files:

MFB470-MDA-SS2009-Project1

Problem 2 - Group xx

Personal No. o List	Fam. Name	First Name	Stud. Group	Mat.-No.

Please add lines for each user of the group.

- 2) A group has maximum 2 persons. The groups are defined before handout and can not changed later.
- 3) I want to get a report in paper form, simple fixed. The report contains definition of the project (task), derivation of equations, drawings, diagrams, main results.
Handwriting is possible. One group has one report.
Hand over must be in time and in the post case near the faculty office.
- 4) Additionally, I want a folder (compressed by zip) containing all files of mathematical calculations done by math programs send by mail to Wallrapp@hm.edu.
Mail-Subject: MDA_Pro1_Problem2_Groupxx << very important.
File-Name: MDA_Pro1_Problem2_Groupxx.extension << very important -
other files are not accepted!
Never use "Umlaute" in the text and file name !!!
- 5) The project is a part of the exam in MDA and will be valid by points / later by a mark. Each user in a group will get the same mark. The proposed points are given in the task description. The maximum is 50 points.