

Workload about 18 h

Date of issue Mo 10.05.10, Deadline Mo 31.05.10 - 18:00 o'clock.

Description of Problem:**System-Input:** Crank motion**Test Bench for a given function****System-Output:** Motion of load device

Problem 1: Given is the linear function $\Delta s(\varphi = 0..100\% = 360^\circ)$ of an output link slider and an input crank (angle φ), where $\Delta s(\varphi = 0) = 0$ is the first toggle position of the slider. Moreover a Δs -scale of 80 mm/100 % is used, see Fig 1.

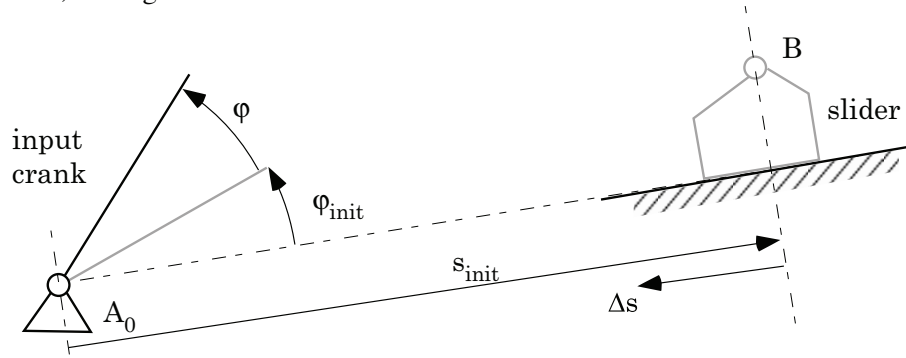


Fig. 1: Input values of the output slider

Problem 2: Given is the angular function $\Delta\psi(\varphi = 0..100\% = 360^\circ)$ of an output link rocker and an input crank (angle φ), where $\Delta\psi(\varphi = 0) = 0$ is the with a first toggle position of the rocker. Moreover a $\Delta\psi$ -scale of $80^\circ / 100\%$ is used, see Fig 2. The base line A_0B_0 should be about 100 mm.

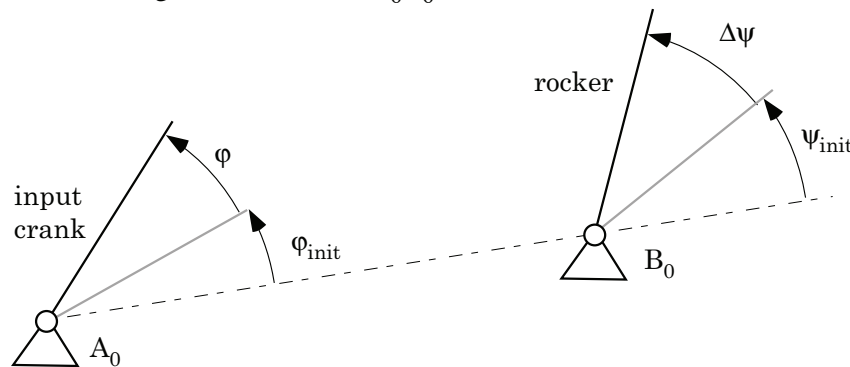


Fig. 2: Input values of the output rocker

The figure 3 and the table 1 shows the given diagram and data of an output link that have to be driven by a simple planar mechanism with a constant angular crank velocity to yielding a periodical revolution in a time of 12 sec.

Solve: <proposed credit points>

1) <7>

- Draw a sketch of the proposed mechanism and
- show/describe the number of parameters, the known and unknown once, as well
- list the requirements.
- Describe the proposed solution approach to find a solution.

2) <12>

- Use an adapted graphical method to find a first solution (solu1)
- Compare the results from solu1 with the given function (Fig. 3). Show errors and discuss these.

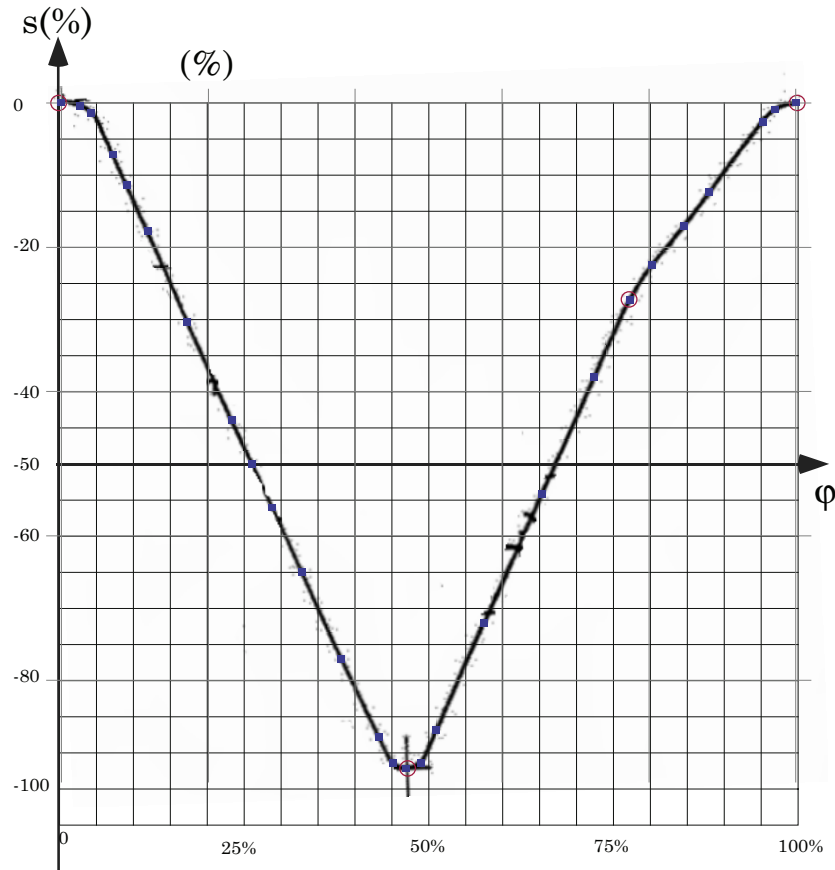
3) <28>

- Based on the solution solu1 setup a numerical optimisation formulation of the proposed mechanism to reduce the error the first solution. The new solution (called solu2) should be found based on points of the diagram (Fig 3) as much as possible (min = 6).
- Compare the results from solu2 with the given function (Fig. 3). Show errors and discuss these.
- Compute and plot all functions of a mechanism as output function, transmission angle, toggle values, velocity of output link.
- Show the motion of the system with an animation.

4) <3> For a good layout and readability.

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Fig. 3: Diagram of the goal function s or $\psi(\varphi)$ Table 1: Digital of values: $\varphi(\%)$, $-\Delta s(\%)$ or $-\Delta\psi(\%)$.

$\{0, 0\}$,
 $\{2.5, 0.4\}$,
 $\{4, -1.4\}$,
 $\{7, -7.2\}$,
 $\{8.9, -11.4\}$,
 $\{11.8, -17.8\}$,
 $\{17.1, -30.3\}$,
 $\{23.2, -43.9\}$,
 $\{26, -50\}$,
 $\{28.7, -56\}$,
 $\{32.8, -65\}$,
 $\{38, -77\}$,
 $\{43.3, -87.9\}$,
 $\{45.1, -91.5\}$,
 $\{47, -92.2\}$,
 $\{48.9, -91.5\}$,
 $\{51, -86.9\}$,
 $\{57.5, -72.1\}$,
 $\{65.4, -54.2\}$,
 $\{72.5, -38\}$,
 $\{77.4, -27.3\}$,
 $\{80.4, -22.4\}$,
 $\{84.8, -17\}$,
 $\{88.2, -12.3\}$,
 $\{95.5, -2.6\}$,
 $\{97.2, -0.9\}$,
 $\{100, 0\}$

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Basic Restrictions:

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

MFB470-MDA-WS2009-Project1**Problem 1 - 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. Please clip together the report, without folder, etc. Handwriting is possible. One group has one report.
Hand over must be in time and in my personal post case near the faculty office.

The report contains definition of the project (task of all points), derivation of equations, drawings, diagrams, main results with a final discussion. The Maple file is only for the check of the computational process.

- 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_Problem1_Groupxx << very important.

File-Name: MDA_Pro1_Problem1_Groupxx.zip << very important -
other files are not accepted!

Never use "Umlaute" in file names !!!

- 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. Please note what each student has done on the project.