Technical Test – Design Space Exploration

Introduction

The intent of this test is to evaluate your implementation and coding skills, as well as application knowledge, and presentation skills. Focus is on the Matlab environment.

The intent is that these tasks are performed in Matlab. For this purpose, you can use Matlab Online, which is freely available for 20 hours / month. This should be sufficient for this task. (you will need to create a personal account on the Mathworks site, and then you will have access to the tool).

You will be evaluated on:

- Presentation of the results produced (both presentation skills, and the results themselves).
- Clarity/readability of the code/files used.
- Skill level specific in Matlab
- Adhering to the general best practices when coding.

As deliverables, you will need to present your findings to us in a short (max 3 slides, max 10 minutes) presentation, then show us the methodology used to obtain these findings.

Important remark: if you have access to Matlab via your current employer, please do not use that license for this work, as this is probably not allowed. The free access to the online environment should be sufficient.

Test 3

Perform a Design Space Exploration to assess the drivetrain model provided and **determine the model parameters that result in the lowest total energy consumption** when following the WLTC Class 3 cycle (can be found publicly available), for the below vehicle.

- Mass: 2000 kg
- Rolling resistance coefficient: 0.009
- Aerodynamic resistance coefficient: 0.3
- Frontal surface: 4 m^2
- Drivetrain details: A Functional Mockup Unit (FMU) model has been provided (eduModel.fmu) that represents the drivetrain. This FMU has two input parameters:
    - **ratio**: the gearbox ratio of the reducer. Has a valid range of 5 – 15.
    - **motorConfig**: represents a specific motor configuration. Can be 1, 2, or 3 to select from the three provided motor configurations.

Deliverables:

- A short (max 3 slides, max 10 minutes) presentation on the results of the design space exploration, and the identified optimum configuration.
    - You will need to give the 10 minute presentation as part of the interview.
    - The slides should be provided in a PowerPoint or a PDF format.
- Code/files used to generate the results.
    - Simulink files should be provided as *.slx files compatible with Matlab 23b. **Make sure to save in R2023b using "export to Previous version"**
- All deliverables must be received within 7 calendar days of the sending of this assignment, even if this is before the scheduled follow-up interview.