THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Vehicle battery state and parameters estimator for demonstration vehicle**
Author's name:	**Masopust Ondřej**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Control Engineering
Thesis reviewer:	M.Sc. Václav Knap Ph.D.
Reviewer's department:	Department of Electrotechnology

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **challenging**

How demanding was the assigned project?

The topic of the project is timely and addresses the current needs of the battery management system functionalities required in the industry. The project spans from the processing of the measured data, battery model parametrization and validation, to the development of the state estimation and its thorough evaluation. The scope and depth of the assignment are sufficiently extensive, and the project is viewed as challenging.

Fulfilment of assignment **fulfilled with minor objections**

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

Overall, the assigned tasks, as defined in the assignment, were covered and achieved. However, the specific goals were not explicitly defined within the thesis. Moreover, the implementations were not documented in thorough detail. Nevertheless, the thesis is viewed as successfully completed.

Methodology **correct**

Comment on the correctness of the approach and/or the solution methods.

In general, the workflow follows a commonly adopted structure: modeling, parametrization, construction of state estimators, models and algorithms testing, and validation. The methodology is well composed. The thesis would benefit from the state-of-the-art overview that would serve as a strong background for the used approaches and methods.

Technical level **C - good.**

Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?

The student applied various technical procedures and approaches to accomplish the assigned activities. Namely, model parametrization, UKF improvements, and estimation were well described, explained, and illustrated. The performance of individual components, such as modeling or state estimation, is well validated and assessed. However, a weaker aspect is the lack of theoretical explanations for certain parts of the model, such as the thermal component, and the absence of an explicit description—specifically, equations for either theory or the implementation of extended or unscented Kalman filters.

Formal and language level, scope of thesis **B - very good.**

Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?

The formal requirements of the thesis are fulfilled. The language level is acceptable considering the level of the work. The thesis is organized logically. The coverage of the thesis is sufficient, except for a too brief description of background, motivation, and state-of-the-art.

Selection of sources, citation correctness	**B - very good.**
Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?	
The utilized sources are well-selected, although the work would benefit from a state-of-the-art overview that would require further sources. The student should accommodate a deeper analysis and a critical approach toward used sources, especially when they are in the form of another master thesis, which does not guarantee correctness or sufficient explanations. The references are well-used in the text, and it is possible to clearly distinguish information taken from other sources and the student's own contribution. The exception is the numbering of references in the text, which is not in a logically consequential order.	

Additional commentary and evaluation (optional)
Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.
The thesis targeted the present topic dedicated to lithium-ion batteries and electric vehicles. The student demonstrated his skill in terms of data processing, simulation, and state estimation. The strengths are in the presentation and assessment of the results. The weaknesses lie in forming and presenting the theoretical background and describing in detail the specific implementations.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

The master thesis 'Vehicle Battery State and Parameters Estimator for Demonstration Vehicle' tackled a challenging topic in a well-rounded way. The student managed to achieve all the determined activities and goals in the assignment and demonstrated their own technical skills. The objections are mainly related to the in-depth documentation of the carried-out work implementation, which would further elevate the work and allow for straightforward reusability. Nevertheless, the mentioned flaws do not significantly reduce the quality of the work. The grade that I award for the thesis is **B - very good.**

The questions for the student:

1) What is the general structure of a lithium-ion battery (as an example use the one used in this work)?
2) How did you determine the 'middle' point in the RC parameter identification procedure, as illustrated in Figure 4.15?
3) Why did you extrapolate missing data for RC parameters as 'flat', i.e., by the nearest value, and not according to the shape, as for example R0 parameter was treated? How could it impact the simulation results?
4) What is the meaning of the quantity denoted as Q_{dep}?

Date: **22.1.2024** Signature: