THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Gearshift simulation model of a dog clutch**
Author's name:	**Vijay Jeyaraman**
Type of thesis:	master
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Automotive, Combustion Engine and Railway Engineering
Thesis reviewer:	Ing. Štěpán Dyk, Ph.D.
Reviewer's department:	University of West Bohemia, Faculty of Applied Sciences, Department of Mechanics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment   **challenging**

How demanding was the assigned project?

The thesis deals with the computational modelling of the dog clutch. It requires general knowledge of the shifting mechanism, creation of a design in CAD software, modelling skills in MBD software and a work with experimental data. Hence the assignment can be considered challenging enough for the master thesis.

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.

All the objectives given in the section 1.3. have been achieved. However, from the reviewer's point of view, simulation analyses (chap. 4.4 and chap. 5 plus appendixes) could have been discussed more in detail and more results could have been shown.

Methodology   **correct**

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

The thesis is well structured, it is logically divided into chapters and subchapters: in the beginning, motivation and introduction is presented, then the theoretical background is described. The modelling part, discussion of the obtained results and conclusion follows. The results are discussed even with respect to the future work.

Technical level   **B - very 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 shows good technical view in the field of gearboxes. For clearer interpretation, the reviewer recommends usage of bold symbols for matrices and vectors (eqns. (2)-(12) and others). Also, the scheme in the Fig. 18 is a bit misleading as it shows linear visco-elastic coupling, while nonlinear Herzian contact is used in the simulations.

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 language is clear and understandable. Level of English is satisfactory. The reviewer recommends mentioning and commenting all the figures in the text - there are several figures with no references and no discussion in the text.

Selection of sources, citation correctness	D - satisfactory.
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 thesis includes 21 references which are correctly cited in the text. However, the references could be written more in detail. Also, the usage of primary sources (papers in the journals etc.) may should be better than citing the secondary ones (e.g. Researchgate.net) or Wikipedia.	

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

The reviewer appreciates the range of the work done by the student: it includes study on the theoretical description of multibody dynamic systems, building geometrical model in CAD software, creation of the multibody dynamical model in MSC.Adams and the work with experimental data during the validation. The work is well and logically written, it fulfils all the given assignments and it makes a good basis for the future work. Presented model promises interesting results with respect to the possible parametric studies and parametric optimisation of the dog geometry. However, results of the numerical simulations may could be analysed more in-depth and in the wider way.

The reviewer adds several notes and questions for the author:

- As noted in chap. 2.4, regularized friction-velocity characteristics is used in the computational model. Could the author comment how would the dynamic behaviour of the model changed if the stiction phase was described correctly? How important role the author thinks the stiction phenomenon plays in the dynamic behaviour of the dog clutch, especially in the engaged phase?

- During dynamical simulations of multibody systems, the knowledge of time dependent forces and kinematic quantities is important to evaluate the system behaviour. It would be helpful to show more quantities than engagement time and dog displacement – e.g. the time behaviour of normal and tangential forces acting in contact between both parts of dog clutch, dog velocities etc.

- To make the results more comparable with the experimental measurements, the model could be easily extended considering robot arm or other parts that add the flexibility to the system.

Considering all the above mentioned, the grade that the reviewer awards for the thesis is **B - very good.**

Date: **2.9.2019**

Signature: Ing. Štěpán Dyk, Ph.D.