The presented PhD thesis deals with the range of 98 pages with the problematics of vector control of electric drives with the utilization of genetic algorithm. Achieved results are documented by the means of simulations and also experimentally in the form of waveforms of important physical quantities. The content of the thesis is divided into six chapters followed by references, author's publications and projects. According to recommendations for preparation of the opponents' opinions, I evaluate this work from the following viewpoints:

**a) Comments on relevance to the practice and development of the science branch**

The topic of the PhD thesis is very present as it is focused on control systems in the field of modern sensor and sensorless control methods with the utilization of genetic algorithm. Each sensor and sensorless method works with parameters, which depend on the parameters of the machine. However, the machine parameters are difficult to obtain and, moreover, they change during the motor running. There are a lot of methods for identification of the parameters, of which genetic algorithms represent a perspective method. For these reasons, the importance of such a research in the area of artificial intelligence for sensor and sensorless control methods of electric drives is growing significantly and it is absolutely essential in the field of electrical machines, apparatus and drives.

**b) Evaluation how the dissertation fulfilled the stated goals**

In my opinion, the chosen solution procedure fully complies with both the general practices and mentioned objectives in the Chapter 2. The actual solution is contained in chapters 4 and 5. The work is logically divided from the introduction to the control methods and mathematical models of individual drive parts, further to some control structures of IM vector control and introduction of genetic algorithm and finally to the applications of genetic algorithms for some parts of sensor and sensorless vector control structure.
Designed and implemented solutions are subsequently verified experimentally. This also fulfills the goals of the PhD thesis.

c) Comments on problem solving procedure. Comments on the results of the dissertation work with the concrete contribution of the thesis author

The work focuses mainly on the design of structures of vector control of an induction motor using the genetic algorithm. The introductory part of the thesis describes the mathematical model of an induction motor which is followed by the description of important control methods of AC machines. It also includes the introduction into problematic of the genetic algorithms.

The main part of the thesis focuses on possible applications of genetic algorithms in induction motor vector control structures. It solves PID parameters optimizations using genetic algorithm, IM parameters estimation using genetic algorithm and artificial neural network, and also parameters estimation of MRAS observer in sensorless control. Each part of the chapter is added with the simulation results which show correct behavior of the mentioned methods.

The last chapter presents the experimental results which are made by measuring important IM variables. The individual experiments are documented by the waveforms of these variables. I consider the above mentioned two parts to be the author's core result and the main contribution of the author to scientific field.

Comments to the dissertation and questions to the author are attached in the appendix. This does not reduce the level of this work in any way and can be used during the defense discussion.

d) Comments on formal level of the thesis

The dissertation has a very good formal level. Individual chapters of the thesis create logical continuity of the solved problems and enable a good understanding of the given problem. There are a few misprints or grammatical mistakes, graphic processing also has a high level.

e) Comments on dissertation's publications

A list of publications of the author is available on pages 96 and 97. It consists of 19 titles in total. 4 of which are indexed in the Web of Science database or in the Scopus database. The author has 4 articles and 6 publications in conference proceedings indexed in WoS or SCOPUS. The author participated in 3 student grant competition of VSB – Technical university of Ostrava.

The main part of the work has been published sufficiently.

f) Conclusion

The PhD thesis contains a number of new insights about the utilization of genetic algorithms in AC controlled drives.

Due to high professional level, the significant contribution to the field of AC control drives and also to the precise processing, the PhD thesis fulfills the requirements of the law.
I recommend this PhD thesis for public presentation, after the successful defense I also recommend to award the PhD degree to Mr. Ing. Thinh Cong Tran.

In Ostrava, 23. 11. 2018

doc. Ing. Petr Palacký, Ph.D.

Attachment:

Questions to discuss in the defense:

- Describe the implementation of Cuckoo method for simulations in Matlab-Simulink.
- What is the main reason why does Cuckoo method provide better results in comparison with other methods (see figure 4.33)?