Supervisor's judgement of doctoral candidate Nawfal Al-Zubaidi R-Smith, MSc.

Nawfal Al-Zubaidi R-Smith, MSc. joined the internal doctoral studies on September 1, 2014, as a foreign self-payer student, at the Institute of Radio Electronics FEEC BUT in Brno, in branch of Electronics and Communications of the study programme Electrical Engineering and Communication, on the topic *Methods of Numerical Inversion of Laplace Transforms for Electrical Engineering*.

His educational background include: 2009, Bachelor of Science (Bc.) from Yarmouk University, Irbid, Jordan, in branch of Electrical Engineering and Communication, and 2013, Master of Science (MSc.) from Blekinge Institute of Technology, Karlskrona, Sweden, in branch of Electrical Engineering with Emphasis on Radio Communication. From May to September 2013, he worked as a Research assistant at the Department of Computer Science, Aarhus University, Aarhus, Denmark.

Shortly after he joined the Ph.D. studies Nawfal R-Smith started his participation in the project of the Czech Science Foundation *Research of signal integrity at high-speed interconnects*, 2015-17, especially in the area of development and application of methods of numerical inversion of Laplace transforms (NILT) for solving transient processes in distributed-parameters systems. From the beginning of 2017, he was also a member of the research team of the project of the Grant Agency BUT in Brno *Design of Novel Functional Blocks and Algorithms for Modern Communication Systems*. From April 1 to August 10, 2018, the Ph.D. student completed his Research Exchange at the Department of Integrated Circuits and System Design, Johannes Kepler University Linz, Austria, with prof. dr. Robert Wille.

Nawfal R-Smith regurally published results of his doctoral research in scientific journals and in international conferences. To date, 9 records can be found in Web of Science database, 12 records in Scopus database, and another 7 publications outside these databases. The most important results are included in two foreign impacted journals with main authorship, *Journal of Circuits, Systems and Computers*, and *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*. In the frame of participations in conferences he received two awards, "The best paper award" at The 40th International Conference on Telecommunications and Signal Processing, July 2017, Barcelona, Spain, and the third place at The 23rd Conference STUDENT EEICT 2017, April 2017, BUT in Brno, Czech Republic.

The Ph.D. student submitted a doctoral thesis *Methods of Numerical Inversion of Laplace Transforms for Electrical Engineering and Their Applications* in the end of August 2018. The work is of extent 132 pages, consisting of 7 chapters, including State of the Art, Dissertation Objectives, and Research Challenges and Conclusions. I can say that regardless of some formal imperfections the main aims of the dissertation thesis were fulfilled successfully. There are especially detailed elaboration and modifications of hyperbolic NILT methods under inclusion of various techniques for acceleration of the convergence of infinite series, and above all an extension of single-variable hyperbolic NILT method towards two variables and its detail error analysis. A valuable contribution to the practical use of the research is the set of respective Matlab codes. In the application part, fruithful results have been obtained in branch of simulation of lossy transmission lines, including multiconductor ones, modelled by fractional-order elements, enabling to cover effects of various frequency-dependent losses. This is a contribution to the area of fractional calculus application being a very up-to-date topic nowadays. No less interesting preliminary results have been achieved in the area of simulation of nonlinear elecrical circuits with the help of Volterra series expansion and multivariable NILTs, which research is still under development.

The Ph.D. candidate Nawfal R-Smith, MSc. has carefully fulfilled all his duties throughout the course of his studies and has been actively involved in the research activities at the department. He also clearly demonstrated his vision for future research in the area under consideration. I believe that both the dissertation itself and the applicant's scientific research activities are in full compliance with the requirements on the Ph.D. degree and I therefore highly recommend the thesis defense.

Brno, November 19, 2018   prof. Ing. Lubomír Brančík, CSc.
                                                                              supervisor