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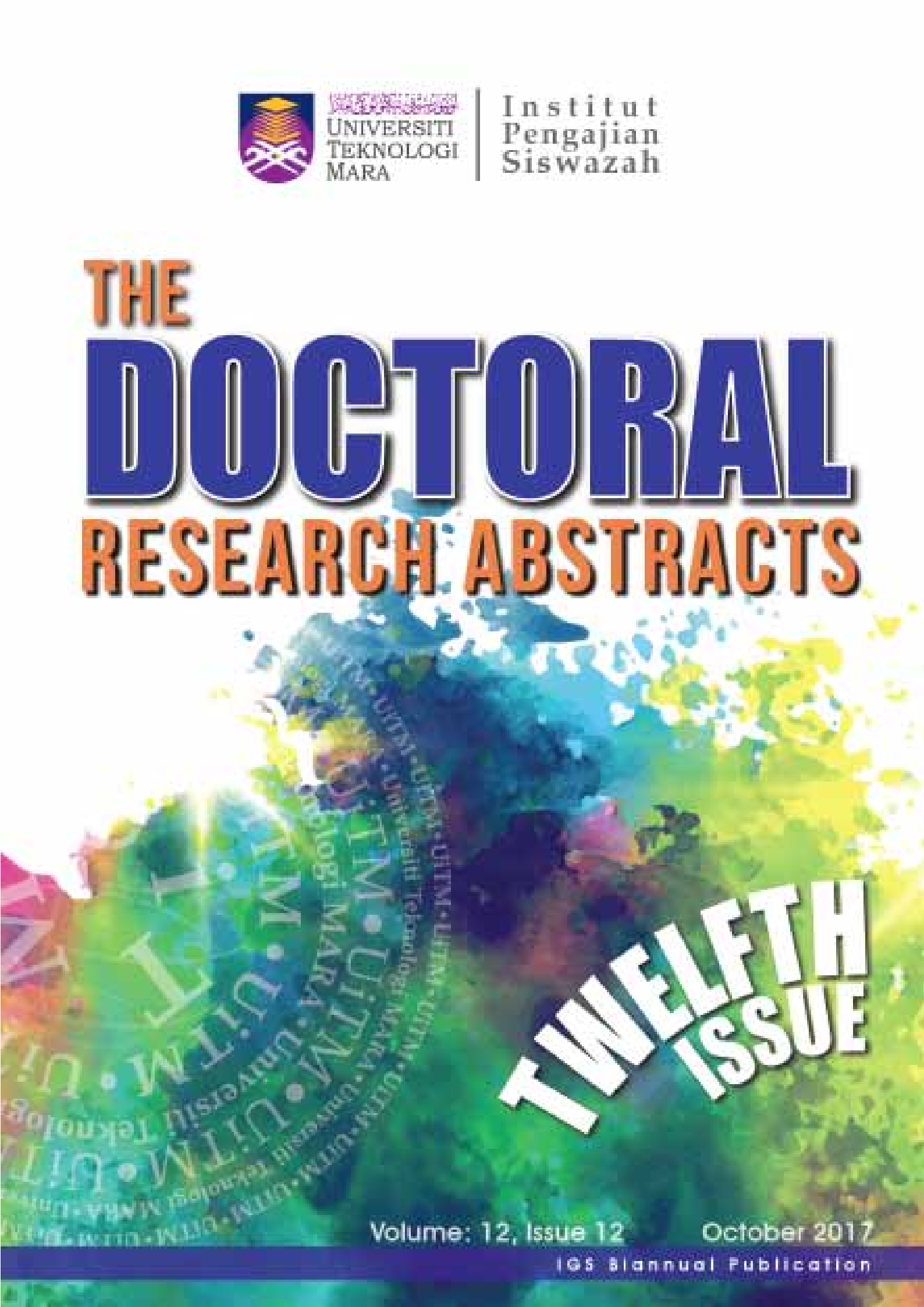
THE DOCTORAL RESEARCH ABSTRACTS



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Title : IMPROVED HYBRID METHODS IN SOLVING SINGLE VARIABLE NONLINEAR ALGEBRAIC EQUATIONS

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Nonlinear problem is one of the most frequently occurring problems in scientific works especially in science and engineering applications. Amongst the most popular schemes are the Newton's method and homotopy perturbation method. However, the duration to converge are heavily depends on how close the guess value is to the real root/s and the rate of convergence for Newton's method is only order-2 and its efficiency index is only $\sqrt{} \approx 1.41421$. Secondly, some of the methods utilized successive approximation procedure to ensure every step of computing will converge to the desired root and one of the most common problems is the improper initial values for the iterative methods. Thus, this particular research aims to develop an improved numerical solution for solving nonlinear equations by using hybrid concept and higher order correctional terms. Higher order successive approximations are applied and evaluated to ensure it converges to the desired root/s more effectively. Two sets of schemes of hybrid algorithms, the Higher Order Taylor-Perturbation method (HTP) and Higher Order Homotopy Taylor Perturbation method (HHTP) with higher order correctional terms up to 6th order are derived and evaluated. The theoretical and numerical results used to verify the stability, consistency and convergence of the schemes. Numerical examples and comparison studies are used to illustrate and to support the efficiency of the suggested method. Furthermore, a new definition of computational order of convergence are defined and analyzed. Next, in order to jumpstart the process of iteration, an improved way to choose the initial- value is also discussed and evaluated numerically. As a result of hybriding several methods, both improved algorithms of HTP and HHTP established faster, more reliable and better outputs, in comparison to other classical methods. The computational tools such as Maple 14 and Mathematica 7.0 are used for this research.