

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**INTEGRAL ITERATIVE METHOD FOR SOLVING
NEWELL-WHITEHEAD-SEGEL EQUATION**

P12S19

**NUR'ATIKAH BINTI KHUSAIRI (2017198679)
NURUL IZZATY BINTI ABDUL GHAFAR (2017586401)
SITI NUR SYAFIQAH BINTI SYED HUZAINI (2017921301)**

**Report submitted in partial fulfilment of the
requirement for the degree of
Bachelor of Science (Hons.) Mathematics
Faculty of Computer and Mathematical Sciences**

DECEMBER 2019

ACKNOWLEDGEMENT

First of all, we would like to thank Allah SWT for giving us a strength and patience to finish up this project successfully. We would like to express our gratitude to all those who had guided us in finishing the final report. We heartily thank to our final year project supervisor, Dr Mat Salim Bin Selamat who gave us this opportunity to do this project on the topic Integral Iterative Method for solving Newell-Whitehead-Segel equation which also guide, encourage and support us to do a lot of research and we came to know about so many new things to complete our final year project.

Besides, we would like to owe my deepest thanks to our project guide the Librarian, who providing all the necessary equipment and materials needed on our project work and guided us all along, till the completion of our project work. I would not forget special gratitude to our supportive classmates who were always gives suggestions and sharing opinions with us for any improvements in completing our project.

Lastly, a glorious honour mention goes to our families for their timely support and understandings on us in finalizing this project. Without helps of the particular that mentioned above, this report would not done within the limited time frame.

Contents

ACKNOWLEDGEMENT	i
ABSTRACT	v
1 INTRODUCTION	1
1.1 Problem Statements	4
1.2 Objectives	5
1.3 Significance and Benefit of the Project	5
1.4 Scope of Project	5
1.5 Report Organization	5
2 BACKGROUND THEORY AND LITERATURE REVIEW	7
2.1 Background Theory	7
2.1.1 Newell-Whitehead-Segel Equation	7
2.1.2 Integral Iterative Method (IIM)	8
2.2 Literature Review	9
2.2.1 Newell-Whitehead-Segel Equation	9
2.2.2 Integral Iterative Method (IIM)	11
3 METHODOLOGY AND IMPLEMENTATION	16
3.1 Step 1: Integral Iterative Method (IIM)	18
3.2 Step 2: Integral Iterative Method (IIM) solution of Newel-Whitehead-Segel Equation	19

3.3	Validation	21
4	RESULTS AND DISCUSSION	22
4.1	Problem 1	22
4.2	Problem 2	27
4.3	Problem 3	34
5	CONCLUSION AND RECOMMENDATIONS	36
	References	37
A	Appendix A	40
B	Appendix B	44
C	Appendix C	48

ABSTRACT

In this paper, the Integral Iterative Method (IIM) was executed for form exact solutions of the Newell-Whitehead-Segel equation. Newell-Whitehead-Segel equation can be recognized as nonlinear equation of an important model arising in fluid mechanics. But a nonlinear problem that contained strong nonlinearity and many are unknown. Usually, the iteration method would be used to solve nonlinear problems, but the convergence of iterations methods is very difficult to be achieved. The main objective of this report is approximating accuracy, reliability and efficiency of IIM, when comparing Adomian Decomposition Method (ADM), Laplace Adomian Decomposition Method (LADM) and New Iterative Method (NIM). There are three problems of Newell-Whitehead-Segel equation chosen to be presented in an effective way. Numerous methods such as Variational Iteration Method (VIM), Homotopy Perturbation Method (HPM), and more methods have been used to solve this equation. However, in this paper, this equation is resolved using IIM. Our results show that IIM will be accurate, convenient and reliable in solving the nonlinear problems. IIM and were compared with the LADM, ADM and NIM, show the ability of Newell-Whitehead-Segel equation in solving nonlinear partial differential. Overall, this report made several contributions of Newell-Whitehead-Segel equation using IIM. First, for the first time, it is shown that IIM is better compared to NIM and LADM, which is absolutely convergence for the range of utility of the power series and closest to zero for the result of error value. Second, it is demonstrated that the error of IIM and NIM are compatible since the value of $u(x,t)$ are close to zero compared to ADM. Third, it is concluded that IIM solution could generate the same results with the exact solution. Based on the calculation, IIM is simpler and efficient implement for resolve varied category of non-linear differential and integral equations, since this method only use direct integration method to derive the solution and the results were successfully explained.