

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**SOLVING NEWELL-WHITEHEAD-SEGEL EQUATION BY USING
SEMI ANALYTICAL ITERATIVE METHOD**

P10S18

**AINNUR NASREEN BINTI ROSLI (2016299382)
ALIFAH ILYANA BINTI YUSOFF (2016299332)
NUR MUNIRAH BINTI HASAN (2016631062)**

Bachelor of Science (Hons.) Computational Mathematics

Faculty of Computer and Mathematical Sciences

DECEMBER 2018

ACKNOWLEDGEMENT

IN THE NAME OF ALLAH, THE BENEFICIENT, THE MERCIFUL.

Praise to Allah, with His will, we finally complete the project “Solving Newell-Whitehead-Segel Equation by Using Semi Analytical Iterative method” successfully.

First and foremost, we would like to thank you to Dr. Mat Salim Bin Selamat, our final year project supervisor for his enthusiastic encouragement, patient guidance, and valuable support from time to time in successfully finishing this project especially in writing the report. We were very appreciated for his willingness to spend his time generously in helping us.

Furthermore, we would like to thank our lecturer for the subject code MAT 530, Dr. Khairul Anwar Bin Rasmani, other supervisors as well as the panels for their useful critiques of this project which helped us improved our report and presentation skills. We would also like to send our appreciation to the librarian for giving us permission to use the equipment and materials that we needed in finishing this project.

Besides, special thanks should be given to the teammates, Alifah Ilyana Binti Yusoff and Nur Munirah Binti Hasan for their great cooperation and for the team leader, Ainnur Nasreen Binti Rosli for her assistance in keeping our progress on schedule and guiding the team to achieve the goal. We were also grateful for having supportive friends who share many ideas and suggestions during the completion of this project.

Last but not least, we wish to thank our lovely parents for their continuous prayers for our success, advice, support, and encouragement throughout our study. Without all of them mentioned above, we would not able to finish this project successfully.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	iv
ABSTRACT	v
CHAPTER 1	1
INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	2
1.3 Objective	2
1.4 Significance and Benefit of the Study	3
1.5 Scope and Limitation of the Study	3
1.6 Report Organization	3
CHAPTER 2	4
BACKGROUND THEORY AND LITERATURE REVIEW	4
2.1 Background Theory.....	4
2.1.1 Semi analytical Iterative Method (SAIM)	4
2.1.2 Newell-Whitehead-Segel Equation	4
2.2 Literature Review	5
2.2.1 Semi Analytical Iterative method (SAIM)	5
2.2.2 Newell-Whitehead-Segel Equations	6
2.2.3 Comparison between SAIM and Other Methods	8
CHAPTER 3	9
METHODOLOGY AND IMPLEMENTATION	9
3.1 Methodology	9
3.1.1 Semi-Analytical Iterative method namely SAIM (Al-Jawary & Hatif, 2017)	9
3.1.2 Newell-Whitehead-Segel equation (Patade & Bhalekar, 2015)	10
3.2 Implementation.....	12
3.2.1 Example 1	12
3.2.2 Example 2	15

CHAPTER 4	18
RESULT AND DISCUSSION	18
4.1 Result and Discussion	18
CHAPTER 5	26
CONCLUSION AND RECOMMENDATION	26
5.1 Conclusion and Recommendation.....	26
REFERENCES	27
APPENDIX A: Maple coding for 2 Example of Newell-Segel Whitehead Equation by using SAIM	32

ABSTRACT

Newell-Whitehead-Segel equation (NWS) is nonlinear Partial Differential equation (PDE) and used in modelling various phenomena arising in fluid mechanics. Generally, the iteration method used to solve nonlinear problems. But, the convergence of iteration methods is very difficult to achieve. In recent years, different methods used to solve NWS equation such as Adomian Decomposition method (ADM), Homotopy Perturbation method (HPM), New Iterative method (NIM), and Laplace Adomian Decomposition method (LADM) but the calculation takes large memory in the computer and the solution is quite difficult. In this study, NWS equation will be solve by using Semi Analytical Iterative method (SAIM) since it's never been used to solve this problem and to determine accuracy and efficiency of the method when compared with exact solution and those obtained by other methods which are ADM, LADM, and NIM (Patade and Bhalekar, 2015). The result obtained is better accuracy compared to the existing methods. This indicates the efficiency of SAIM in solving NWS equation. In the future study, SAIM is accurate, useful, and reliable for solving the nonlinear problem since there is no need for calculating derivatives or multiple integral and less computational works is demanded by using SAIM.