

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

ANALYTICAL SOLUTION FOR  
ONE-DIMENSIONAL ADVECTION-DISPERSION  
OF THE  
POLLUTION IN THE RIVER

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b>	<b>ii</b>
<b>TABLE OF CONTENTS</b>	<b>iii</b>
<b>LIST OF FIGURES</b>	<b>v</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>ABSTRACT</b>	<b>vii</b>
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Research Background	1
1.2 Problem Statement	3
1.3 Research Objective	3
1.4 Significant Of Project	4
1.5 Scope Of Project	4
<b>2 LITERATURE REVIEW</b>	<b>5</b>
2.1 Water pollution and the remediation	5
2.2 Governing Equation	6
2.3 Method of solution	8
<b>3 METHODOLOGY</b>	<b>10</b>
3.1 Zero Dispersion	10
3.2 Including Dispersion	11
<b>4 IMPLEMENTATION</b>	<b>12</b>
4.1 Zero Dispersion	12
4.2 Including Dispersion	16
	iii

## **ABSTRACT**

Laplace transformation technique was used to find analytical solution for one-dimensional advection dispersion equation. The one-dimensional advection dispersion equation was been model for the pollutant and dissolved oxygen concentration. It also investigate the alleviation of pollutant in the river. The coupled equation occurs because the oxygen reacts with the pollutant to produce harmless compound. In order to write a complete analytical solution, the advection dispersion behaviour from the graph was studied using MAPLE. As conclusion, the one-dimensional advection dispersion equation can be derived by using Laplace transformation technique. This mathematical model would provide a better planning for controlling water in the river to the future.

# 1 INTRODUCTION

## 1.1 Research Background

The general readability in preserving the quality of the environment has considerably increased in recent year. This is due to ensure the availability of resources for the next generations along with the development. Pollution can be classified as air pollution, soil pollution, surface pollution and ground water pollution. In the field of surface waters, many problems cause by pollutant release.

Water is essential to life. Many rivers and especially those crossing inhabited areas are subjected to pollutant discharge. Major problem of Water pollution in many countries are from human activities, either industrial or domestic. Approximately 25 million persons die as a result of water pollution every year Pimpunchat et al. (2009). There is increasing concern about water quality worldwide, with increased pollution having a serious impact on the environment.

There are many factors to be considered when assessing the quality of water in the river such as the level of dissolved oxygen, chemical oxygen demand, environment hormones, the level of suspended solids, such as heavy metal and the presence of bacteria Pimpunchat et al. (2009). Furthermore, another two critical factor affecting survival, movement and growth of fish are stream temperature and dissolved oxygen. A river would be aquatic desert devoid of fish, plant, and insect without dissolved oxygen.

There are exposed to many kind of chemical and biological pollutant of agricultural waste that added in the river. This importance to know how can predict the size of the pollutant concentration,  $C(x,t)$  at the certain time,  $t$  and procedure to control pollutant by increasing the concentration of the dissolved oxygen,  $X(x,t)$  by Ibrahim et al. (2015).