

## **TABLE OF CONTENTS**

ACKNOWLEDGEMENT	i	
ABSTRACT	ii	
LIST OF FIGURES	iv	
LIST OF TABLES	Viii	
TABLE OF CONTENTS	Xi	
CHAPTER ONE	IMPORTANCE OF TIDAL INFORMATION IN THE STRAITS OF MALACCA	1
1.0	INTRODUCTION	1
1.1	STUDY AREA	1
1.2	THE PROBLEM	2
1.3	THE NEED FOR TIDAL MODELS	3
1.4	UNCERTAINTIES IN THE MODEL SOLUTIONS	4
1.5	OBJECTIVES AND SCOPE OF STUDY	6
1.6	OUTLINE OF THE THESIS	7
CHAPTER TWO	TIDAL MOTION AND NUMERICAL MODEL	12
2.0	INTRODUCTION	12
2.1	TIDES AND TIDAL FORCING	13
2.2	TIDAL CONSTITUENTS	15
2.3	NUMERICAL MODELLING OF TIDAL MOTION	18
2.4	A BRIEF REVIEW OF TIDAL STUDY AND MODELLING IN THE STRAITS OF MALACCA	19

## **TABLE OF CONTENTS**

ACKNOWLEDGEMENT	i
ABSTRACT	ii
LIST OF FIGURES	iv
LIST OF TABLES	Viii
TABLE OF CONTENTS	Xi
<b>CHAPTER ONE</b>	<b>IMPORTANCE OF TIDAL INFORMATION IN THE STRAITS OF MALACCA 1</b>
1.0	INTRODUCTION 1
1.1	STUDY AREA 1
1.2	THE PROBLEM 2
1.3	THE NEED FOR TIDAL MODELS 3
1.4	UNCERTAINTIES IN THE MODEL SOLUTIONS 4
1.5	OBJECTIVES AND SCOPE OF STUDY 6
1.6	OUTLINE OF THE THESIS 7
<b>CHAPTER TWO</b>	<b>TIDAL MOTION AND NUMERICAL MODEL 12</b>
2.0	INTRODUCTION 12
2.1	TIDES AND TIDAL FORCING 13
2.2	TIDAL CONSTITUENTS 15
2.3	NUMERICAL MODELLING OF TIDAL MOTION 18
2.4	A BRIEF REVIEW OF TIDAL STUDY AND MODELLING IN THE STRAITS OF MALACCA 19

2.4.1	REGIONAL STUDIES BY WYRTKI, 1961.	20
2.4.2	TIDAL PHENOMENA IN ASEAN WATERS BY GUOY, T.K., 1989.	20
2.4.3	NUMERICCAL TIDAL MODEL BY MIHARDJA, D.K. AND RADJAWANE, I.M., 1992	21
2.4.4	HYDRODYNAMIC MODEL BY HADI, S., 1992	22
2.4.5	TIDAL MODELLING BY LEE, G.P., 1994	22
<b>CHAPTER THREE</b>	<b>NUMERICAL MODEL IN PRESENT STUDY</b>	<b>24</b>
3.0	GOVERNING EQUATIONS	24
3.1	NUMERICAL FORMULATION	26
3.1.1	DISCRETIZATION SCHEME	26
3.1.2	EXPLICIT TIME INTEGRATION	28
3.1.3	FINITE DIFFERENCE EQUATIONS AND SOLUTION METHOD	28
3.2	BOUNDARY CONDITIONS	30
3.3	INITIAL STATE	31
3.4	APPLICATION OF THE MODEL TO THE STRAITS OF MALACCA	32
3.4.1	SPATIAL GRID SYSTEM	32
3.4.2	TIME STEP/ TEMPORAL GRID	32
3.4.3	BATHYMETRY DATA	33
3.4.4	ESTIMATION OF BOTTOM FRICTION COEFFICIENT	34
3.5	COMPUTER MODEL	35

<b>CHAPTER FOUR</b>	<b>RESULTS AND DISCUSSIONS</b>	<b>38</b>
4.0	AVAILABLE TIDAL DATA IN THE STRAITS OF MALACCA	38
4.1	BEHAVIOUR OF THE NUMERICAL MODEL IN THE SPIN-UP PHASE	43
4.2	PARAMETRIC STUDY IN THE QUASI-STEADY OSCILLATING PHASE	46
4.3	VARIATION OF DRAG COEFFICIENT IN THE QUADRATIC FRICTION LAW	49
4.3.1	INFLUENCE OF DRAG COEFFICIENT ON M2 TIDAL AMPLITUDES	49
4.3.2	INFLUENCE OF DRAG COEFFICIENT ON M2 TIDAL PHASES	52
4.4	INVESTIGATION OF DEPTH DEPENDENCY OF DRAG COEFFICIENT IN A POWER LAW	54
4.4.1	INFLUENCE OF COEFFICIENTS IN THE POWER LAW ON M2 TIDAL AMPLITUDES	54
4.4.2	INFLUENCE OF COEFFICIENTS IN THE POWER LAW ON M2 TIDAL PHASES	57
4.5	INVESTIGATION OF DIFFERENT CURVE FITTING OF ELEVATION AT THE OPEN BOUNDARIES	60
4.5.1	INFLUENCE OF DIFFERENT FITTING OF ELEVATION AT OPEN BOUNDARIES ON TIDAL AMPLITUDES	60
4.5.2	INFLUENCE OF DIFFERENT FITTING OF ELEVATION AT OPEN BOUNDARIES ON TIDAL PHASES	60
4.6	INVESTIGATION OF PHASE CORRECTION IN THE PRESCRIPTION OF TIDAL ELEVATION AT THE OPEN BOUNDARIES	63

4.6.1	INFLUENCE OF PHASE CORRECTION AT THE OPEN BOUNDARIES ON TIDAL AMPLITUDES	63
4.6.2	INFLUENCE OF PHASE CORRECTION AT THE OPEN BOUNDARIES ON TIDAL PHASES	63
4.7.	RESULTS OF COMPUTATIONS	66
4.7.1	TIDAL AMPLITUDE AND PHASE COMPARISON FOR M2 COMPONENT	66
4.7.2	TIDAL AMPLITUDE AND PHASE COMPARISON FOR S2 COMPONENT	73
4.7.3	TIDAL AMPLITUDE AND PHASE COMPARISON FOR K1 COMPONENT	79
4.7.4	TIDAL AMPLITUDE AND PHASE COMPARISON FOR O1 COMPONENT	86
4.7.5	COMPARISON OF CURRENT SPEED AT CURRENT METER STATIONS A, B AND C	93
4.7.6	COMPARISON OF CURRENT DIRECTION AT CURRENT METER STATIONS A, B AND C.	100
4.7.7	CURRENT DISTRIBUTION IN THE STRAITS OF MALACCA	104
4.7.8	DISCUSSION	109
<b>CHAPTER FIVE</b>	<b>CONCLUSION AND RECOMMENDATIONS FOR FUTURE WORK</b>	<b>112</b>
5.1	CONCLUSIONS	112
5.2	RECOMMENDATIONS FOR FUTURE WORK	113
REFERENCES		114