

**THE DETERMINATION MODULLI OF IRON, ALUMINUM AND
MAGNESIUM MATERIALS USING ULTRASONIC TESTING**

AHMAD SHAFIQ BIN ZAINUDDIN

**BACHELOR OF SCIENCE (Hons.) PHYSICS
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

JULY 2017

ABSTRACT

The three sample of different type of materials (iron, aluminum and magnesium) are used to determine the moduli properties. They were undergoing ultrasonic testing method to determine the longitudinal and shear wave velocity. In determining of wave velocity, we use Echograph instrument to measure time of wave travel through the sample in longitudinal and transverse. From this velocity of wave, the value of moduli (MOE, shear modulus and poisson ratio) can be calculated by using a specific formula. From this experiment, it can be conclude that the iron have the highest value among the samples in MOE and shear modulus but not in poisson ratio. The aluminum sample was the highest in poisson ratio. The magnesium was low on three types of moduli value because it is popular as a brittle material.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS	vii
ABSTRACT	viii
ABSTRAK	Ix
CHAPTER 1: INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	3
1.3 Significance of Study	3
1.4 Objectives	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction	5
2.2 Material for Inspection	6
2.3 Ultrasonic Theory	7
2.4 Ultrasonic Properties and Applications	8
2.6 Recent Research	10
CHAPTER 3: METHODOLOGY	
3.1 Sample Preparation	11
3.2 Apparatus and instrument setup	13
3.3 Sample Evaluation	17

3.4	Analysis Modulus of Elasticity (MOE)	18
3.5	Analysis Shear Modulus	19
3.6	Analysis Poisson Ratio	20
CHAPTER 4:	RESULTS AND DISCUSSION	
4.1	Calibration	21
4.2	Density	22
4.3	Sound velocity	24
4.4	Modulus of elasticity (MOE)	24
4.5	Shear modulus	25
4.6	Poisson ratio	26
4.7	Percentage error	28
4.8	Discussion	29
CHAPTER 5:	CONCLUSION AND RECOMMENDATIONS	
5.1	Conclusion	31
5.2	Recommendation	31
REFERENCES		33
APPENDICES		35
CURRICULUM VITAE		38

LIST OF TABLES

TABLE	CAPTION	PAGE
4.2	Longitudinal velocity of aluminum, iron and magnesium	24
4.3	Tranverse velocity of aluminum, iron and magnesium	24
4.4	Theory on modulli value	28
4.5	Percentage error	28