

# CONTENTS

## ACKNOWLEDGEMENTS

## ABSTRACT

<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	
1.1	Historical Perspective of the Progress in the Field of Fiber Optics	1
1.2	Brief History of Optical Fiber Amplifiers	2
1.3	Overview	4
	References	5
<b>CHAPTER 2</b>	<b>LITERATURE REVIEW OF THEORETICAL BACKGROUND</b>	
	Introduction	6
2.1	Host Glasses and Rare-Earth Ions	7
2.2	General Concepts of Three- and Four-Level Optical Amplifier System	15
2.3	Amplification Characteristics of an Optical Amplifier	17
	2.3.1 Gain Characteristics	18
	2.3.2 Amplified Spontaneous Emission (ASE) and Excited State Absorption (ESA)	22
	2.3.3 Noise Characteristics	25
	2.3.4 Applications of Optical Amplifiers	30
2.4	Model of $\text{Er}^{3+}/\text{Yb}^{3+}$ Codoped Fiber Amplifier	32
	References	38

<b>CHAPTER 3</b>	<b>EXPERIMENTAL RESULTS AND DISCUSSION I</b>	
	Introduction	41
3.1	Experimental Setup	41
3.2	Insertion Loss of Passive Optical Components	46
3.3	Absorption Spectrum of the Er <sup>3+</sup> /Yb <sup>3+</sup> Codoped Fiber	52
3.4	Yb <sup>3+</sup> Fluorescence Emission Spectrum of the Er <sup>3+</sup> /Yb <sup>3+</sup> Fiber	58
	References	70
<b>CHAPTER 4</b>	<b>EXPERIMENTAL RESULTS AND DISCUSSION II</b>	
	Introduction	72
4.1	Determination of Optimum Pump Wavelength in the 800nm Band	73
4.2	Performance of a 813nm-pumped EYDFA	
	4.2.1 Counter-pumped Configuration	75
	4.2.2 A Comparison of EYDFA Performance Between Backward Pumping and Forward Pumping Configuration	91
4.3	A Comparison of Amplifier Performance Between EDFA and EYDFA at 813nm Pump	94
4.4	A Comparison of EYDFA at 980nm and 813nm Pump	101
	References	108
<b>CHAPTER 5</b>	<b>CONCLUSIONS AND SUGGESTIONS</b>	
5.1	Conclusions	111
5.2	Suggestions For Future Work	113
<b>APPENDIX</b>		115