

## CONTENTS

	PAGE NO.
DECLARATION	i
CERTIFICATE	ii
ACKNOWLEDGEMENT	iii
LIST OF PUBLICATIONS	v

### CHAPTER- I : SEMICONDUCTOR SUPERLATTICES AND THEIR PROPERTIES : AN INTRODUCTION

1.1	Introduction to semiconductor compositional superlattices	1
1.2	Types of semiconductor compositional superlattices	5
	(a) Type- I superlattice	5
	(b) Type- II superlattice	5
	(c) Type- III superlattice	6
	(d) Modulation doping superlattice	6
1.3	Doping superlattices or N-I-P-I structures	6
1.4	Strained superlattices	7
1.5	Coupled plasmon-phonon modes	8
1.6	Light scattering in superlattices	11
1.7	Electron-electron and Electron-impurity scattering and its implications	13
	References	16

### CHAPTER-II : PLASMONS AND THEIR DAMPING IN A DOPED SEMICONDUCTOR SUPERLATTICE

2.1	Introduction	18
2.2	Formalism	19
2.3	Results and discussion	22
2.4	Summary	29
	References	30

**CHAPTER-III :      PLASMON - PHONON COUPLED MODES AND THEIR  
                         LINESHAPES FOR A COMPOSITIONAL SUPERLATTICE OF TYPE-II**

3.1	Introduction	31
3.2	Frequencies of collective excitations	33
3.2.1	Intrasubband plasmons	34
3.2.2	Intersubband plasmons	40
3.3	The lineshapes of plasmon-phonon coupled modes	43
3.4	Summary	47
	References	51

**CHAPTER- IV : THE RELAXATION TIME OF A CHARGE CARRIER DUE  
                         TO SCATTERING BETWEEN CHARGE CARRIERS IN A  
                         SEMICONDUCTOR SUPERLATTICE**

4.1	Introduction	53
4.2	Formalism and calculations	55
	(A) Type-I superlattice	56
	(B) Type-II superlattice	59
4.3	Results and Discussion	61
	(A) Results on $\tau_1$	61
	(B) Results on $\tau_2$	67
4.4	Summary	70
	References	73