## Table of contents

a. Abstract	i-iii
b. Declaration	iv
c.Certificate	ν
d.Acknowledgements	vi-vii
e. Table of contents	viii-x
f. List of tables	xi
g. List of figures	xii-xix
h. Academic programs participated	xx
i. List of research publications	xxi-xxii
CHAPTER-1	[1-14]
Acoustic waves and instabilities in quantum plasmas: a con	cise overview
Abstract	1
1.1 A brief plasma overview	1-7
1.1.1 Genesis of plasma physics	4
1.1.2 Plasma physics in various fields	4-5
1.1.3 Classical and quantum plasmas	5-7
1.2 Acoustic waves and instabilities in plasmas	7-9
1.3 Motivation	9-10
1.4 Objectives	10
1.5 Methodology	10-11
1.6 Concluding remarks	11-12
References	12-14
CHAPTER -2	[15-27]
Jeans instability in astrophysical viscoelastic fluids with geometr	ical curvature
effects	
Abstract	15
2.1 Introduction	15-17
2.2 Physical model and formalism	17-19

2.3 Linear stability analysis	19-21
2.4 Results and discussions	21-24
2.5 Conclusions	24-25
References	25-27
CHAPTER -3	[28-49]
Nucleus-acoustic wave dynamics in gyrogravitating electrospherically	confined
degenerate quantum plasmas	
Abstract	28
3.1 Introduction	28-30
3.2 Physical model and formalism	30-36
3.3 Linear stability analysis	36-39
3.4 Results and discussions	39-45
3.5 Conclusions	45-46
References	46-49
CHAPTER-4	[50-71]
Behaviours of ion-acoustic waves in relativistic gyromagnetoactive	quantum
plasmas	
Abstract	50
4.1 Introduction	50-52
4.2 Physical model and formalism	52-57
4.3 Linear stability analysis	57-60
4.4 Results and discussions	60-66
4.5 Conclusions	66-68
References	68-71
CHAPTER -5	[72-107]
Nucleus-acoustic waves in ONe and CO white dwarf cores and nearly do	egenerate
envelopes	
Abstract	72
5.1 Introduction	72-75
5.2 Physical model and formalism	75-83

5.3 Linear stability analysis	83-86
5.4 Results and discussions	86-100
5.4.1 Analysis of the completely degenerate ONe core	87-91
5.4.2 Analysis of the nearly degenerate transition region around O	Ne core 91-94
5.4.3 Analysis of the completely degenerate CO core	94-97
5.4.4 Analysis of the nearly degenerate transition region around Co	O core 97-100
5.5 Conclusions	101-102
References	102-107
CHAPTER-6	[108-142]
Acoustic stability of astrophysical gyromagnetoactive viscous cylindri	cal plasmas
Abstract	108
6.1 Introduction	108-110
6.2 Physical model and formalism	110-114
6.3 Linear stability analysis	114-122
6.3.1 Quantum (completely degenerate) non-planar regime	120
6.3.2 Quantum (completely degenerate) planar regime	120
6.3.3 Classical (completely non-degenerate) non-planar regime	120-121
6.3.4 Classical (completely non-degenerate) planar regime	121-122
6.4 Results and discussions	122-136
6.4.1 Quantum (completely degenerate) non-planar regime	123-127
6.4.2 Quantum (completely degenerate) planar regime	127-129
6.4.3 Classical (completely non-degenerate) non-planar regime	130-133
6.4.4 Classical (completely non-degenerate) planar regime	133-136
6.5 Conclusions	136-138
References	138-142
CHAPTER -7	[143-149]
Conclusions and future prospects	
7.1 Concluding remarks	143-146
7.2 Future prospects	146-147
References	147-149