

# Contents

List of Figures	iv
List of Tables	vi
<b>1 INTRODUCTION.</b>	<b>1</b>
1.1 Prologue . . . . .	1
1.2 Evidences for the existence of Dark Matter in the galactic halo	3
1.2.1 Astrophysical evidence . . . . .	6
1.2.2 Gravitational flat rotational curve . . . . .	7
1.2.3 Galaxy clusters . . . . .	8
1.2.4 Gravitational lensing . . . . .	9
1.3 Broad outline of the aim and plan of the thesis . . . . .	11
<b>2 DARK MATTER MODELS.</b>	<b>16</b>
2.1 Introduction . . . . .	16
2.2 Dark Matter Models . . . . .	17
2.2.1 Cold Dark Matter (CDM) model . . . . .	17
2.2.2 Scalar Field Dark Matter (SFDM) model . . . . .	21
<b>3 BOSE-EINSTEIN CONDENSATE MODEL: AN APPROACH TO GET RID OFF FROM PROBLEMS IN CDM MODELS.</b>	<b>40</b>
3.1 Introduction . . . . .	40
3.2 Static Newtonian Bose-Einstein Condensate . . . . .	43
3.3 Dark Matter as a Bose-Einstein Condensate . . . . .	45
3.4 Navarro–Frenk–White (NFW) model . . . . .	49
3.5 Comparison of the BEC model with CDM model . . . . .	50
3.6 A common behavior among some dark matter profiles . . . . .	54

<b>4</b>	<b>PERFECT FLUID DARK MATTER MODEL AND CAUTIONS REGARDING THE DETERMINATION OF HALO MASS.</b>	<b>67</b>
4.1	Introduction . . . . .	67
4.2	Perfect Fluid solution of the Dark Matter . . . . .	69
4.2.1	Features of the Perfect Fluid solution . . . . .	70
4.3	Einstein's equations for Perfect Fluid and Scalar Field model	73
4.3.1	Discrepancy of mass functions . . . . .	75
4.3.2	Measurement of discrepancies via deflection angle . . .	78
<b>5</b>	<b>CONFORMAL GRAVITY: A DIFFERENT APPROACH TO EXPLAIN FLAT ROTATIONAL CURVE.</b>	<b>81</b>
5.1	Introduction . . . . .	81
5.2	Local effects on rotational velocity in conformal gravity . . .	82
5.3	Global contributions to local motions . . . . .	88
5.4	Contribution of gases and bulges . . . . .	93
5.5	Limit on the size of galaxies . . . . .	95
<b>6</b>	<b>CONSTRAINT ON CENTRAL DARK MATTER DENSITY IN THE EDDINGTON INSPIRED BORN-INFELD (EiBI) GRAVITY.</b>	<b>98</b>
6.1	Introduction . . . . .	98
6.2	Outline of the EiBI halo model . . . . .	102
6.3	Outline of the Mannheim-O'Brien conformal gravity model .	108
6.4	Upper limit on density for stability . . . . .	115
6.5	Central and mean dark matter density . . . . .	122
6.6	Testing the limit on the Milky Way . . . . .	125
6.7	Discussion . . . . .	130
<b>7</b>	<b>CONCLUSIONS.</b>	<b>142</b>