

# Contents

## Chapter 1

- 1.1 Introduction
- 1.2 Broad outline of the aim and plan of the thesis:

## Chapter 2

- 2.1 Introduction
- 2.2 The PPN formalism
- 2.3 The classical tests of general relativity
- 2.4 A quest for higher order effects:

## Chapter 3

Testing gravity at the second post-Newtonian level through gravitational deflection of particles having mass

- 3.1 Introduction
- 3.2 Gravitational deflection of massive particles at second post-Newtonian order
- 3.3 Other Significant effect
- 3.4 Discussion

## Chapter 4

Static spherically symmetric solutions of the vacuum Brans-Dicke theory

- 4.1 Introduction
- 4.2 Static spherically symmetric vacuum solutions of the BD theory
- 4.3 Physical viability of Brans solutions
- 4.4 Generic nature of Brans class I solution
- 4.5 Physical relevance of Brans class I black hole
- 4.6 Discussion

## Chapter 5

### Strong field gravitational lensing in the Brans-Dicke theory

- 5.1 Introduction
- 5.2 The BD theory in Jordan and Einstein frames
- 5.3 Deflection angle in the strong field regime
- 5.4 Strong field observable
- 5.5 Discussion

## Chapter 6

### Brans-Dicke theory: Jordan vis-a-vis Einstein Frame

- 6.1 Introduction
- 6.2 Second-order deflection angle
- 6.3 Deflection angle in the BD theory
- 6.4 Discussion

## Chapter 7

### Wormholes in vacuum Brans-Dicke theory

- 7.1 Introduction
- 7.2 Physically viable spherical symmetric vacuum solutions of the BD theory
- 7.3 Brans wormholes
- 7.4 Usability
- 7.5 Discussion

## Chapter 8

### Conclusions

**The content of this thesis is based on the following published works**

1. Testing gravity at the second post-Newtonian level through gravitational deflection of particles having mass, A. Bhadra, K. Sarkar and K.K. Nandi, *Phys. Rev. D* **75**, 123004 (2007)
2. Brans-Dicke theory: Jordan vis-a-vis Einstein Frame, A. Bhadra, K. Sarkar, D. P. Datta and K. K. Nandi, *Mod. Phys. Letts. A* **22**, 367 (2007)
3. Strong field gravitational lensing in the Brans-Dicke theory, K. Sarkar and A. Bhadra, *Class. Quant. Grav.* **23**, 6101 (2006)
4. On static spherically symmetric solutions of the vacuum Brans-Dicke theory, A. Bhadra and K. Sarkar, *Gen. Rel. Grav.* **37**, 2189 (2005)
5. Wormholes in vacuum Brans-Dicke theory, A. Bhadra and K. Sarkar, *Mod. Phys. Letts. A* **20**, 1831 (2005)