

Contents

List of Figures	v
List of Tables	vi
1 Introduction	1
1.1 η and η' Mesons: discovery, basic properties	3
1.2 Symmetries and pseudoscalar η and η'	5
1.2.1 $SU(3)_f$ symmetry and its breaking	5
1.2.2 $SU(3)_{f5}$ symmetry and its breaking	6
1.3 $\eta - \eta'$ mixing	8
1.4 Nature of Quantum Chromodynamics	10
1.5 Axial $U(1)$ anomaly and η' meson	11
1.6 OZI rule and η, η' mesons	12
1.7 QCD Sum Rules	13
1.8 Exclusive processes in QCD	16
1.9 Objectives of the present study and organisation of thesis	18
2 Eta-nucleon and Eta-prime-nucleon Coupling constants in QCD and the role of gluons	20

2.1	A glimpse on studies of ηNN , $\eta' NN$ coupling constants	22
2.2	Formalism and construction of Sum Rules	25
2.3	Analysis of sum Rules and results	31
2.4	Summary and conclusion	33
2.5	Appendix	35
3	Electromagnetic transition form factors of light pseudoscalar mesons	38
3.1	A glimpse on some studies of electromagnetic transition form factors of light pseudoscalar mesons	39
3.1.1	pQCD and TFFs of light pseudoscalar mesons	40
3.1.2	The pion's case	42
3.1.3	The case of η and η'	45
3.2	Twist-six corrections to transition form factors of η and η' mesons . .	54
3.3	Numerical analysis of result	60
3.4	Summary and conclusion	68
3.5	Appendix	70
4	Summary and conclusion	73
	Bibliography	86
	List of Publications	87