

CONTENTS

SECTION AND/OR DESCRIPTION	PAGE NO.
Title Page	i
Certificate of Approval	ii
Certificate	iii
Declaration	iv
Acknowledgements	v
List of Symbols and Abbreviations	vi
Abstract	vii
Contents	viii-x
Chapter 1 Introduction	1-22
1.1 General Statement and Scope of the Work	1
1.2 Previous Work	4
1.3 Geodynamic Setting of the Proterozoic Kolhan Basin	7
1.4 Objectives and Organization of the Work	8
1.5 Methods of Study	11
1.5.1 Field Work and Field Methods	11
1.5.2 Laboratory Investigation	13
1.5.3 Numerical and Computational Methods	16
1.6 Contributions of the Research Student	22
Chapter 2 Geological and Geomorphological Setting of the Area	23-30
2.1 Introduction	23
2.2 Geological Setting	23
2.3 Geomorphology of the Study Area	25
2.3.1 Physiographic Features	25
2.4 General Lithology, Distribution and Field Relationships	28
2.4.1 Older Metamorphic Group (OMG)	28
2.4.2 Older Metamorphic Tonalite-gneiss (OMTG)	28
2.4.3 Singhbhum Granite	28
2.4.4 Iron Ore Group (IOG)	29
2.4.5 Jagannathpur and Malangtoli Lavas	29
2.4.6 Kolhan Group	30
Chapter 3 Lithology and Lithounit Characteristics	31-76
3.1 Introduction	31
3.2 Lithounits	31
3.2.1 Conglomerate-Pebbly Sandstone-Granular Sandstone	31
3.2.2 Sandstone	34
3.2.3 Siltstone and Shale	34

SECTION AND/OR DESCRIPTION	PAGE NO.
3.3 Structures of Mechanical Origin	36
3.3.1 Structures Related to Flat Bed	36
3.3.2 Structures Generated by Bedform Migration	40
3.3.3 Apposition Fabrics	44
3.3.4 Soft Sediment Deformation (Bedding Contortion Structures)	44
3.4 Lithofacies	46
3.4.1 Granular Lag Facies (GLA)	46
3.4.2 Granular Sandstone Facies (GSD)	47
3.4.3 Sheet Sandstone Facies (SSD)	48
3.4.4 Plane Laminated Sandstone Facies (PLSD)	48
3.4.5 Rippled Sandstone Facies (RSD)	50
3.4.6 Thin Laminated Siltstone-Sandstone Facies (TLSD)	50
3.5 Stratal Architecture	50
3.5.1 Vertical Profile Sections	50
3.5.2 Markov Chain Analysis	54
3.5.3 Layer Thickness Variations	69
3.5.4 Cross-association Analysis	70
Chapter 4 Petrographic, Textural and Geochemical Characteristics	77-135
4.1 Introduction	77
4.2 Petrographic Characteristics and Modal Analysis	77
4.2.1 Clast-Matrix Ratio	87
4.2.2 Origin of Matrix and Cement	87
4.2.3 Pre- and Post-Depositional Alterations	89
4.2.4 Classifications	89
4.2.5 Heavy Mineral Assemblages	96
4.3 Provenance History	99
4.4 Textural Characteristics	100
4.4.1 Univariate Plots	112
4.4.2 Bivariate Plots	115
4.4.3 CM Diagram	118
4.4.4 Linear Discriminant Functions	119
4.4.5 Roundness Analysis	122
4.4.6 Sediment Framework Geometry	124
4.5 Sediment Trend Matrix Analysis	128
4.6 Geochemical Characteristics	130
4.6.1 Tectonic Setting-Provenance	132
4.6.2 Paleoweathering-Paleoclimate	133

SECTION AND/OR DESCRIPTION	PAGE NO.
Chapter 5 Paleocurrents, Paleohydraulics and Dispersal Pattern	136-147
5.1 Introduction	136
5.2 Paleocurrent Patterns	136
5.2.1 Granular Lag (GLA) and Granular Sandstone (GSD) Facies	142
5.2.2 Sheet Sandstone (SSD), Plane Laminated Sandstone (PLSD) and Rippled Sandstone (RSD) Facies	143
5.2.3 Thin Laminated Siltstone-Sandstone (TLSD) Facies	144
5.3 Paleohydraulic Analysis	144
Chapter 6 Lithofacies Association and Integrated Sedimentation History	148-174
6.1 Introduction	148
6.2 Lithofacies Association	148
6.2.1 Shallow Braided Fluvial Plain Facies Association	149
6.2.2 Ephemeral Sheet Flood Facies Association	151
6.3 Source Area	152
6.4 Transport Mechanism and Dispersal	153
6.5 Sedimentation History	156
Chapter 7 Summary and Conclusions	175-182
7.1 Summary of the Work	175
7.2 Conclusions	181
7.3 Limitations	181
7.4 Future Scope of the Work	182
References	183-202
Appendices	203-209
Appendix A Paleohydrologic Parameters	203
Appendix B Computation Sheets for Chi-square Test and Circular Arithmetic Mean (θ_m)	204
Appendix C Markov Chain Analysis	206
C.1 Transition Count Matrix $[f_{ij}]$	206
C.2 Independent Trials Probability Matrix $[r_{ij}]$	207
C.3 Transition Probability Matrix $[p_{ij}]$	208
C.4 Test of Significance	208
Appendix D Discriminant Analysis	209
D.1 Sahu's (1964) Method	209
D.2 Sevon's (1966) Method	209
Curriculum Vitae	210-211