

INDEX

| CONTENTS | | Page No. |
|------------------------|---|---------------------|
| List of Tables | | i |
| List of Figures | | viii |
| CHAPTER-1 | | |
| 1.1 | Introduction | 1 |
| 1.2 | Intermolecular forces | 5 |
| 1.3 | Brief Review of Literature | 9 |
| 1.4 | Nature and scope of the present work | 22 |
| 1.5 | References | 27 |
| CHAPTER-2 | | |
| 2.1 | Measurement of density: Review and Measurement | 34 |
| 2.2 | Measurement of sound: Review and method adopted | 40 |
| 2.3 | Viscosity Measurement: Review and Measurement | 54 |
| 2.4 | Source of materials and Purification methods | 61 |
| 2.5 | References | 67 |
| CHAPTER-3 | | |
| 3.1 | Introduction | 72 |
| 3.2 | Density and excess volume data of binary mixtures of 3-chloroaniline with di/tri chloro substituted benzenes at T=(303.15 - 318.15) K | 73 |
| 3.3 | Isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data of binary mixtures of 3-chloroaniline with di/tri chloro substituted benzenes at T= (303.15 - 318.15) K | 82 |
| 3.4 | Viscosity (η), deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) of binary mixtures of 3-chloroaniline with di/tri chloro substituted benzenes at T=(303.15 - 318.15) K | 95 |
| 3.5 | Viscosity Models and Interaction Parameters | 106 |
| 3.6 | Conclusion | 109 |
| 3.7 | References | 112 |
| CHAPTER-4 | | |
| 4.1 | Introduction | 114 |
| 4.2 | Density and Excess volume data of binary mixtures of 3-chloroaniline with isomeric Chlorotoluenes at T=(303.15-318.15)K | 115 |
| 4.3 | Isentropic compressibility (κ_s) and excess isentropic compressibilities (κ_s^E) data of binary mixtures of 3-chloroaniline with isomeric chlorotoluenes at T= (303.15 - 318.15) K | 124 |

| | | |
|-----------------------------|--|------------|
| 4.4 | Viscosity (η), deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) of binary mixtures of 3-chloroaniline with isomeric chlorotoluenes at T= (303.15 - 318.15) K | 136 |
| 4.5 | Viscosity Models and Interaction Parameters | 146 |
| 4.6 | Conclusion | 151 |
| 4.7 | References | 152 |
| CHAPTER-5 | | |
| 5.1 | Introduction | 153 |
| 5.2 | Density and excess volume data of binary mixtures of 3-chloroaniline with substituted ethanols at T= (303.15 - 318.15) K | 153 |
| 5.3 | Isentropic compressibility (κ_s) and excess isentropic compressibilities (κ_s^E) data of binary mixtures of 3-chloroaniline with substituted ethanols at T= (303.15 - 318.15) K | 162 |
| 5.4 | Viscosity (η), deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) of binary mixtures of 3-chloroaniline with substituted ethanols at T= (303.15 - 318.15) K | 174 |
| 5.5 | Viscosity Models and Interaction Parameters | 184 |
| 5.6 | Conclusion | 189 |
| 5.7 | References | 190 |
| CHAPTER-6 | | |
| 6.1 | Introduction | 191 |
| 6.2 | Density and excess volume data of binary mixtures of 3-chloroaniline with mono substituted benzene derivatives (bromobenzene, chlorobenzene and nitrobenzene) at T=(303.15-318.15) K | 192 |
| 6.3 | Isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data of binary mixtures of 3-chloroaniline with mono substituted benzene derivatives at T= (303.15-318.15)K | 201 |
| 6.4 | Viscosity (η), deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) of binary mixtures of 3-chloroaniline with mono substituted benzene derivatives at T= (303.15 - 318.15) K | 213 |
| 6.5 | Viscosity Models and Interaction Parameters | 223 |
| 6.6 | Conclusion | 228 |
| 6.7 | References | 229 |
| CHAPTER-7 | | |
| SUMMARY | | 231 |
| LIST OF PUBLICATIONS | | 241 |

LIST OF TABLES

| Table No. | Description | Page No. |
|-------------|---|----------|
| Table 2.4.2 | Literature [105-119] values and these were in good agreement with literature values at 303.15 K | 66 |
| Table 3.2.1 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 1,2-dichlorobenzene at T=(303.15-318.15) K | 76 |
| Table 3.2.2 | Mole fraction of 3-chloroaniline (x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 1,3-dichlorobenzene at T=303.15-318.15) K | 77 |
| Table 3.2.3 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 1,2,4-trichlorobenzene at T=(303.15-318.15)K | 78 |
| Table 3.2.4 | Values of the parameters of computed from Redlich-Kister equation 3.2.2 and standard deviation, σ (V^E) at T=(303.15-318.15)K | 79 |
| Table 3.3.1 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 1,2-dichlorobenzene at T=(303.15-318.15) K | 86 |
| Table 3.3.2 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 1,3-dichlorobenzene at T=(303.15-318.15) K | 87 |
| Table 3.3.3 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 1,2,4-trichlorobenzene at T=(303.15-318.15) K | 88 |
| Table 3.3.4 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 1,2-dichlorobenzene at T= (303.15 -318.15) K | 89 |
| Table 3.3.5 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 1,3-dichlorobenzene at T= (303.15 -318.15) K | 90 |

| | | |
|-------------|--|-----|
| Table 3.3.6 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 1,2,4-trichlorobenzene at T= (303.15 -318.15) K | 91 |
| Table 3.3.7 | Values of the parameters computed from Redlich-Kister equation 3.3.6 and standard deviation, $\sigma(\kappa_s^E)$ at T=(303.15-318.15) K | 92 |
| Table 3.4.1 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixture of 3-chloroaniline with 1,2-dichlorobenzene at T= (303.15-318.15) K | 98 |
| Table 3.4.2 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with 1,3-dichlorobenzene at T= (303.15-318.15) K | 99 |
| Table 3.4.3 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with 1, 2, 4-trichlorobenzene at T= (303.15-318.15) K | 100 |
| Table 3.4.4 | Values of the parameters of computed from Redlich-Kister equation 3.4.2 and standard deviation $\sigma(\Delta\eta)$ at T = (303.15-318.15) K | 101 |
| Table 3.5.1 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq -3.5.1), Katti and Chaudhri (Eq -3.5.2), Hind.et al (Eq-3.5.3), Tamura and Kurata (Eq-3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with 1,2-dichlorobenzene at T= (303.15-318.15) K | 109 |
| Table 3.5.2 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq -3.5.1), Katti and Chaudhri (Eq -3.5.2), Hind (Eq-3.5.3), Tamura and Kurata (Eq-3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with 1,3-dichlorobenzene at T= (303.15-318.15) K | 110 |
| Table 3.5.3 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq -3.5.1), Katti and Chaudhri (Eq -3.5.2), Hind (Eq-3.5.3), Tamura and Kurata (Eq-3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with 1, 2, 4-trichlorobenzene at T= (303.15-318.15) K | 111 |
| Table 4.2.1 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with o-chlorotoluene at T= (303.15-318.15) K | 118 |
| Table 4.2.2 | Mole fraction of 3-chloroaniline (x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with m-dichlorotoluene at T=(303.15-318.15)K | 119 |

| | | |
|-------------|---|-----|
| Table 4.2.3 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with p-chlorotoluene at T= (303.15-318.15) K | 120 |
| Table 4.2.4 | Values of the parameters of computed from Redlich-Kister equation 3.2.2 and standard deviation, σ (V^E) at T = (303.15 -318.15) K | 121 |
| Table 4.3.1 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with o-chlorotoluene at T= (303.15-318.15) K | 127 |
| Table 4.3.2 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with m-chlorotoluene at T=(303.15-318.15) K | 128 |
| Table 4.3.3 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with p-chlorotoluene at T= (303.15-318.15) K | 129 |
| Table 4.3.4 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with o-chlorotoluene at T= (303.15 -318.15) K | 130 |
| Table 4.3.5 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with m-chlorotoluene at T= (303.15 -318.15) K | 131 |
| Table 4.3.6 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with p-chlorotoluene at T= (303.15 -318.15) K | 132 |
| Table 4.3.7 | Values of the parameters of computed from Redlich-Kister equation 3.3. 6 and standard deviation, σ (κ_s^E) at T = (303.15-318.15) K | 133 |
| Table 4.4.1 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixture of 3-chloroaniline with o-chlorotoluene at T= (303.15-318.15) K | 138 |
| Table 4.4.2 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with m-chlorotoluene at T=(303.15-318.15) K | 139 |

| | | |
|-------------|--|-----|
| Table 4.4.3 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with p-chlorotoluene at T= (303.15-318.15) K | 140 |
| Table 4.4.4 | Values of the parameters of computed from Redlich-Kister equation 3.4.2 and standard deviation σ ($\Delta\eta$) at T = (303.15-318.15) K | 141 |
| Table 4.5.1 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq - 3.5.1), Katti and Chaudhri (Eq - 3.5.2), Hind.et al (Eq-3.5.3), Tamura and Kurata (Eq - 3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with o-chlorotoluenene at T=(303.15-318.15)K | 148 |
| Table 4.5.2 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq -3.5.1), Katti and Chaudhri (Eq -3.5.2), Hind (Eq-3.5.3), Tamura and Kurata (Eq-3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with m-chlorotoluene at T= (303.15-318.15) K | 149 |
| Table 4.5.3 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (Eq -3.5.1), Katti and Chaudhri (Eq -3.5.2), Hind (Eq-3.5.3), Tamura and Kurata (Eq-3.5.4) and Heric Brower (Eq-3.5.5) data for binary mixture of 3-chloroaniline with p-chlorotoluene at T= (303.15-318.15) K | 150 |
| Table 5.2.1 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 2-phenylethanol at T=(303.15-318.15) K | 156 |
| Table 5.2.2 | Mole fraction of 3-chloroaniline (x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 2-chloroethanol at T= (303.15-318.15) K | 157 |
| Table 5.2.3 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with 2-aminoethanol at T= (303.15-318.15) K | 158 |
| Table 5.2.4 | Values of the parameters of computed from Redlich-Kister equation 3.2.2 and standard deviation, σ (V^E) at T = (303.15 -318.15) K | 159 |
| Table 5.3.1 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 2-phenylethanol at T=(303.15-318.15) K | 165 |
| Table 5.3.2 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 2-chloroethanol at T=(303.15-318.15) K | 166 |
| Table 5.3.3 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with 2-aminoethanol at T= (303.15-318.15) K | 167 |

| | | |
|-------------|--|-----|
| Table 5.3.4 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 2-phenylethanol at $T = (303.15 - 318.15)$ K | 168 |
| Table 5.3.5 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 2-chloroethanol at $T = (303.15 - 318.15)$ K | 169 |
| Table 5.3.6 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with 2-aminoethanol at $T = (303.15 - 318.15)$ K | 170 |
| Table 5.3.7 | Values of the parameters of computed from Redlich-Kister equation 3.3.6 and standard deviation, σ (κ_s^E) at $T = (303.15 - 318.15)$ K | 171 |
| Table 5.4.1 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixture of 3-chloroaniline with 2-phenylethanol at $T = (303.15 - 318.15)$ K | 176 |
| Table 5.4.2 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with 2-chloroethanol at $T = (303.15 - 318.15)$ K | 177 |
| Table 5.4.3 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with 2-aminoethanol at $T = (303.15 - 318.15)$ K | 178 |
| Table 5.4.4 | Values of the parameters of computed from Redlich-Kister equation 3.4.2 and standard deviation σ ($\Delta\eta$) at $T = (303.15 - 318.15)$ K | 179 |
| Table 5.5.1 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et.al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with 2-phenylethanol at $T = (303.15 - 318.15)$ K | 186 |
| Table 5.5.2 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et.al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with 2-chloroethanol at $T = (303.15 - 318.15)$ K | 187 |

| | | |
|-------------|--|-----|
| Table 5.5.3 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et.al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with 2-aminoethanol at T= (303.15-318.15) K | 188 |
| Table 6.2.1 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with bromobenzene at T= (303.15-318.15) K | 195 |
| Table 6.2.2 | Mole fraction of 3-chloroaniline (x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with chlorobenzene at T= (303.15-318.15) K | 196 |
| Table 6.2.3 | Mole fraction of 3-chloroaniline(x_1), density (ρ) and excess molar volume (V^E) data for the binary mixture of 3-chloroaniline with nitrobenzene at T= (303.15-318.15) K | 197 |
| Table 6.2.4 | Values of the parameters of computed from Redlich-Kister equation 3.2.2 and standard deviation, σ (V^E) at T = (303.15 -318.15) K | 198 |
| Table 6.3.1 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with bromobenzene at T= (303.15-318.15) K | 204 |
| Table 6.3.2 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with chlorobenzene at T=(303.15-318.15) K | 205 |
| Table 6.3.3 | Mole fraction of 3-chloroaniline(x_1), speed of sound (u) isentropic compressibility (κ_s) and excess isentropic compressibility (κ_s^E) data for the binary mixture of 3-chloroaniline with nitrobenzene at T= (303.15-318.15) K | 206 |
| Table 6.3.4 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with bromobenzene at T= (303.15 -318.15) K | 207 |
| Table 6.3.5 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with chlorobenzene at T= (303.15 -318.15) K | 208 |
| Table 6.3.6 | Mole fraction of 3-chloroaniline(x_1), deviation in speed of sound (Δu), deviation in intermolecular free length (ΔL_f) and deviation in acoustic impedance (ΔZ) data for the binary mixture of 3-chloroaniline with nitrobenzene at T= (303.15 -318.15) K | 209 |
| Table 6.3.7 | Values of the parameters of computed from Redlich-Kister equation 3.3. 6 and standard deviation, σ (κ_s^E) at T = (303.15-318.15) K | 210 |

| | | |
|-------------|--|-----|
| Table 6.4.1 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixture of 3-chloroaniline with bromobenzene at T= (303.15-318.15) K | 215 |
| Table 6.4.2 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with chlorobenzene at T= (303.15-318.15) K | 216 |
| Table 6.4.3 | Mole fraction of 3-chloroaniline(x_1), viscosity (η) deviation in viscosity ($\Delta\eta$) and excess Gibbs energy of activation of viscous flow (G^{*E}) data for the binary mixtures of 3-chloroaniline with nitrobenzene at T= (303.15-318.15) K | 217 |
| Table 6.4.4 | Values of the parameters of computed from Redlich-Kister equation 3.4.2 and standard deviation σ ($\Delta\eta$) at T = (303.15-318.15) K | 218 |
| Table 6.5.1 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with bromobenzene at T= (303.15-318.15) K | 225 |
| Table 6.5.2 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with chlorobenzene at T= (303.15-318.15) K. | 226 |
| Table 6.5.3 | Mole fraction of 3-chloroaniline (x_1), Grunberg and Nissan (d_{12}), Katti and Chaudhri (W_{vis}/RT), Hind.et al (H_{12}), Tamura and Kurata (T_{12}) and Heric Brower (Δ_{12}) data for binary mixture of 3-chloroaniline with nitrobenzene at T= (303.15-318.15) K | 227 |

LIST OF FIGURES

| Figure | Description | Page No. |
|-----------|--|----------|
| Fig.3.2.1 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (■), 1,3-dichlorobenzene (●) and 1,2-dichlorobenzene (▲) at 303.15 K | 80 |
| Fig.3.2.2 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (□), 1,3-dichlorobenzene (○) and 1,2-dichlorobenzene (Δ) at 308.15 K | 80 |
| Fig.3.2.3 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (★), 1,3-dichlorobenzene (☆) and 1,2-dichlorobenzene (✱) at 313.15 K | 81 |
| Fig.3.2.4 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (◆), 1,3-dichlorobenzene (◇) and 1,2-dichlorobenzene (✱) at 318.15 K | 81 |
| Fig.3.3.1 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (■), 1,3-dichlorobenzene (●) and 1,2-dichlorobenzene (▲) at 303.15 K | 93 |
| Fig.3.3.2 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (□), 1,3-dichlorobenzene (○) and 1,2-dichlorobenzene (Δ) at 308.15 K | 93 |
| Fig.3.3.3 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (★), 1,3-dichlorobenzene (☆) and 1,2-dichlorobenzene (✱) at 313.15 K | 94 |
| Fig.3.3.4 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (◆), 1,3-dichlorobenzene (◇) and 1,2-dichlorobenzene (⊗) at 318.15 K | 94 |
| Fig.3.4.1 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (■), 1,3-dichlorobenzene (●) and 1,2-dichlorobenzene (▲) at 303.15 K | 102 |
| Fig.3.4.2 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (□), 1,3-dichlorobenzene (○) and 1,2-dichlorobenzene (Δ) at 308.15 K | 102 |

| | | |
|-----------|--|-----|
| Fig.3.4.3 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (★), 1,3-dichlorobenzene (☆) and 1,2-dichlorobenzene (✱) at 313.15 K | 103 |
| Fig.3.4.4 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (◆), 1,3-dichlorobenzene (◇) and 1,2-dichlorobenzene (⊗) at 318.15 K | 103 |
| Fig.3.4.5 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (■), 1,3-dichlorobenzene (●) and 1,2-dichlorobenzene (▲) at 303.15 K | 104 |
| Fig.3.4.6 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (□), 1,3-dichlorobenzene (○) and 1,2-dichlorobenzene (△) at 308.15 K | 104 |
| Fig.3.4.7 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (★), 1,3-dichlorobenzene (☆) and 1,2-dichlorobenzene (✱) at 313.15 K | 105 |
| Fig.3.4.8 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 1,2,4-trichlorobenzene (◆), 1,3-dichlorobenzene (◇) and 1,2-dichlorobenzene (⊗) at 318.15 K | 105 |
| Fig.4.2.1 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (■), m-chlorotoluene (●) and o-chlorotoluene (▲) at 303.15 K | 122 |
| Fig.4.2.2 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (□), m-chlorotoluene (○) and o-chlorotoluene (△) at 308.15 K | 122 |
| Fig.4.2.3 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (★), m-chlorotoluene (☆) and o-chlorotoluene (✱) at 313.15K | 123 |
| Fig.4.2.4 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (◆), m-chlorotoluene (◇) and o-chlorotoluene (⊗) at 318.15 K | 123 |
| Fig.4.3.1 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (■), m-chlorotoluene (●) and o-chlorotoluene (▲) at 303.15 K | 134 |

| | | |
|-----------|---|-----|
| Fig.4.3.2 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\square), m-chlorotoluene (\circ) and o-chlorotoluene (Δ) at 308.15 K | 134 |
| Fig.4.3.3 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\star), m-chlorotoluene (\star) and o-chlorotoluene (\star) at 313.15 K | 135 |
| Fig.4.3.4 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 3-chloroaniline with p-chlorotoluene (\blacklozenge), m-chlorotoluene (\diamond) and o-chlorotoluene (\otimes) at 318.15 K | 135 |
| Fig.4.4.1 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\blacksquare), m-chlorotoluene (\bullet) and o-chlorotoluene (\blacktriangle) at 303.15K | 142 |
| Fig.4.4.2 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\square), m-chlorotoluene (\circ) and o-chlorotoluene (Δ) at 308.15K | 142 |
| Fig.4.4.3 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\star), m-chlorotoluene (\star) and o-chlorotoluene (\star) at 313.15K | 143 |
| Fig.4.4.4 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\blacklozenge), m-chlorotoluene (\diamond) and o-chlorotoluene (\otimes) at 318.15 K | 143 |
| Fig.4.4.5 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\blacksquare), m-chlorotoluene (\bullet) and o-chlorotoluene (\blacktriangle) at 303.15 K | 144 |
| Fig.4.4.6 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\square), m-chlorotoluene (\circ) and o-chlorotoluene (Δ) at 308.15 K | 144 |
| Fig.4.4.7 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\star), m-chlorotoluene (\star) and o-chlorotoluene (\star) at 313.15 K | 145 |
| Fig.4.4.8 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with p-chlorotoluene (\blacklozenge), m-chlorotoluene (\otimes) and o-chlorotoluene (\diamond) at 318.15 K | 145 |

| | | |
|-----------|--|-----|
| Fig.5.2.1 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline for the binary liquid mixtures of 3-chloroaniline with 2-aminoethanol (\blacktriangle), 2-chloroethanol (\bullet) and 2-phenylethanol (\blacksquare) at 303.15 K | 160 |
| Fig.5.2.2 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\square), 2-chloroethanol (\circ) and 2-aminoethanol (Δ) at 308.15 K | 160 |
| Fig.5.2.3 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\star), 2-chloroethanol (\star) and 2-aminoethanol (\otimes) at 313.15 K | 161 |
| Fig.5.2.4 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 3-chloroaniline with 2-phenylethanol (\blacklozenge), 2-chloroethanol (\diamond) and 2-aminoethanol (\otimes) at 318.15 K | 161 |
| Fig.5.3.1 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-aminoethanol (\blacktriangle), 2-chloroethanol (\bullet) and 2-phenylethanol (\blacksquare) at 303.15 K | 172 |
| Fig.5.3.2 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\square), 2-chloroethanol (\circ) and 2-aminoethanol (Δ) at 308.15 K | 172 |
| Fig.5.3.3 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\star), 2-chloroethanol (\star) and 2-aminoethanol (\otimes) at 313.15K | 173 |
| Fig.5.3.4 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol(\blacklozenge), 2-chloroethanol(\diamond) and 2-aminoethanol(\otimes) at 318.15 K | 173 |
| Fig.5.4.1 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-aminoethanol (\blacktriangle), 2-chloroethanol (\bullet) and 2-phenylethanol (\blacksquare) at 303.15 K | 180 |
| Fig.5.4.2 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\square), 2-chloroethanol (\circ) and 2-aminoethanol (Δ) at 308.15 K | 180 |
| Fig.5.4.3 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\star), chloroethanol (\star) and 2-aminoethanol (\otimes) at 313.15K | 181 |
| Fig.5.4.4 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\blacklozenge), 2-chloroethanol(\diamond) and 2-aminoethanol (\otimes) at 318.15 K | 181 |

| | | |
|-----------|---|-----|
| Fig.5.4.5 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-aminoethanol (\blacktriangle), 2-chloroethanol (\bullet) and 2-phenylethanol (\blacksquare) at 303.15K | 182 |
| Fig.5.4.6 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\square), 2-chloroethanol (\circ) and 2-aminoethanol (\triangle) at 308.15 K | 182 |
| Fig.5.4.7 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\star), 2-chloroethanol (\star) and 2-aminoethanol (\otimes) at 313.15 K | 183 |
| Fig.5.4.8 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with 2-phenylethanol (\blacklozenge), 2-chloroethanol (\diamond) and 2-aminoethanol (\otimes) at 318.15 K | 183 |
| Fig.6.2.1 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline for the binary liquid mixtures of 3-chloroaniline with bromobenzene (\blacksquare), chlorobenzene (\bullet) and nitrobenzene (\blacktriangle) at 303.15 K | 199 |
| Fig.6.2.2 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\square), chlorobenzene (\circ) and nitrobenzene (\triangle) at 308.15 K | 199 |
| Fig.6.2.3 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\star), chlorobenzene (\star) and nitrobenzene (\otimes) at 313.15 K | 200 |
| Fig.6.2.4 | Variation of excess molar volume (V^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\blacklozenge), chlorobenzene (\diamond) and nitrobenzene (\otimes) at 318.15 K | 200 |
| Fig.6.3.1 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\blacksquare), chlorobenzene (\bullet) and nitrobenzene (\blacktriangle) at 303.15 K | 211 |
| Fig.6.3.2 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\square), chlorobenzene (\circ) and nitrobenzene (\triangle) at 308.15 K | 211 |
| Fig.6.3.3 | Excess isentropic compressibility (κ_s^E) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (\star), chlorobenzene (\star) and nitrobenzene (\otimes) at 313.15 K | 212 |

| | | |
|-----------|---|-----|
| Fig.6.3.4 | Excess isentropic compressibility (κ_s^E) with mole fraction(x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (◆), chlorobenzene (◇) and nitrobenzene (⊗) at 318.15 K | 212 |
| Fig.6.4.1 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (■), chlorobenzene (●) and nitrobenzene (▲) at 303.15K | 219 |
| Fig.6.4.2 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (□), chlorobenzene (○) and nitrobenzene (△) at 308.15 K | 219 |
| Fig.6.4.3 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (★), chlorobenzene (☆) and nitrobenzene (✱) at 313.15 K | 220 |
| Fig.6.4.4 | Variation of deviation in viscosity ($\Delta\eta$) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene(◆), chlorobenzene (◇) and nitrobenzene (⊗) at 318.15 K | 220 |
| Fig.6.4.5 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (■), chlorobenzene (●) and nitrobenzene (▲) at 303.15 K | 221 |
| Fig.6.4.6 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (□), chlorobenzene (○) and nitrobenzene (△) at 308.15 K | 221 |
| Fig.6.4.7 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (★), chlorobenzene (☆) and nitrobenzene (✱) at 313.15 K | 222 |
| Fig.6.4.8 | Excess Gibbs energy of activation of viscous flow (G^{*E}) with mole fraction (x_1) of 3-chloroaniline in the binary liquid mixtures of 3-chloroaniline with bromobenzene (◆), chlorobenzene (◇) and nitrobenzene (⊗) at 318.15 K | 222 |