

LIST OF FIGURES

| S.No. | Figures | Page No. |
|--------------|---|----------|
| Figure 1.1 | Field depressions as a function of the mean depth of the water table during the growing season for various soil types | 8 |
| Figure 1.2 | Soils with salt problems | 8 |
| Figure 1.3 | Difference in root development between drained and undrained plots | 15 |
| Figure 2.1 | Random drainage system | 20 |
| Figure 2.2 a | Parallel drainage system depicting field layout suited to growing a variety of row crops including cotton, corn, soyabeans, sugarcane, sorghum etc. | 21 |
| Figure 2.2 b | Parallel drainage system depicting field layout suited to sugarcane crop | 22 |
| Figure 2.3 | Cross slope system on slight to moderate slopes | 24 |
| Figure 2.4 | Layout of a surface drainage system showing lateral drain, collectoral drains and main drainage channel | 24 |
| Figure 2.5 | An isometric view of relief and interception drains | 26 |
| Figure 2.6 | Types of subsurface drainage system | 28 |
| Figure 2.7 | Rise in watertable due to effective position of the interception drains for reducing seep area | 29 |
| Figure 2.8 a | Intercepting drain at out crop of aquifer | 31 |
| Figure 2.8 b | Interception drain in a constricted aquifer | 32 |
| Figure 2.9 | An open ditch intercepting drain | 34 |
| Figure 2.10 | Mole plough | 34 |

| | | |
|-------------|---|----|
| Figure 2.11 | Cracking and fissuring of heavy soil as a result of mole drainage | 34 |
| Figure 3.1 | Areal Analysis Graph | 42 |
| Figure 3.2 | Diagrammatic presentation of maximum depth area duration curves for a catchment | 43 |
| Figure 3.3 | Equivalent slope for a curved stream profile | 45 |
| Figure 3.4 | Relation of overland time of travel to overland travel distance, average overland slope and the rational runoff coefficient SUH Procedure | 49 |
| Figure 3.5 | SUH Procedure | 52 |
| Figure 3.6 | Relationship between C_t and Imperviousness | 53 |
| Figure 4.1 | Horslev piezometer test (a) geometry and (b) method of analysis | 74 |
| Figure 4.2 | Piezometer test in a confined aquifer (a) geometry and (b) type curves | 76 |
| Figure 4.3 | The Auger Hole method | 78 |
| Figure 4.4 | Nomograph for determination of C in auger hole method for $S > 0.5 H$ | 81 |
| Figure 4.5 | Nomograph for determination of C in auger hole method for $S=0$ | 82 |
| Figure 4.6 | Computation of k by Luthen and Kirkham formula (a) geometry and (b) Nomograph | 83 |
| Figure 4.7 | Guelph permeameter (a) Tripod assembly (b) support tubes (c) reservoir assembly | 87 |
| Figure 4.8 | A bulb of saturated soil | 88 |
| Figure 4.9 | Curves for three classes of soil | 89 |
| Figure 4.10 | Permeameter placement | 91 |
| Figure 4.11 | A view of Guelph permeameter set in the field | 91 |
| Figure 4.12 | Borehole dilution test (a) schematic diagram of | 96 |

apparatus and (b) dilution of tracer with time

| | | |
|-------------|---|-----|
| Figure 4.13 | Distortion of flow pattern caused by the presence of the well screen and sand or gravel pack | 96 |
| Figure 4.14 | Constant head permeameter | 100 |
| Figure 4.15 | Variable head permeameter | 100 |
| Figure 5.1 | A mass curve representation of the SCS rainfall runoff relationship | 115 |
| Figure 5.2 | Variation of Q Vs P for $I_a - 0.2S$ | 120 |
| Figure 5.3 | Runoff hydrograph consequent to a 3 day storm | 123 |
| Figure 5.4 | Determination of rainfall excess | 126 |
| Figure 5.5 | Isocrones of relative travel | 128 |
| Figure 5.6 | Time area concentration diagram | 129 |
| Figure 5.7 | Time area histogram | 129 |
| Figure 5.8 | Velocities for estimating overland flow time | 130 |
| Figure 5.9 | Command area for IGNP and adjoining systems | 135 |
| Figure 5.10 | Water table evaluation at RD838 with provision of intercepting rain | 143 |
| Figure 5.11 | Configuration of flow to two parallel intercepting drains | 152 |
| Figure 5.12 | Surface allegation map of the study area | 155 |
| Figure 5.13 | Particle size distribution curve and filter design | 157 |
| Figure 5.14 | Rate of Water table lowering required for effective drainage of land | 160 |
| Figure 5.15 | Steady flow to two fully penetrating parallel ditches for which Donnan's equation is applicable | 165 |
| Figure 5.16 | Decomposition of the flow domain made for derivation of HOOGHOUTD's equation | 165 |

| | | |
|-------------|---|-----|
| Figure 5.17 | Nomograph for evaluating approximate drain spacing | 168 |
| Figure 7.1 | Well drainage - showing the cones of depression in a group of wells | 181 |
| Figure 7.2 | Raised bed - Sunken bed system | 181 |
| Figure 7.3 | Variation of soil moisture with respect to depth for a typical soil | 188 |
| Figure 7.4 | Variation of capillary pressure (h_c) with volumetric soil moisture content (θ) for touchet silt loam | 194 |
| Figure 7.5 | Variation of $K_{rw}(\theta)$ with h_c for touchet silt loam | 195 |
| Figure 7.6 | Variation of non-dimensional salt concentration with time for different reservoirs (layers) | 197 |
| Figure 7.7 | Variation of non dimensional salt concentration with depth for different time periods | 198 |
| Figure 7.8 | Break through curves as a function of relative salt concentration and volume of infiltrated water in a different reservoirs | 204 |