

THEORY AND DESIGN OF IRRIGATION STRUCTURES Volume I

CHAPTER 1 Necessity of Irrigation

Introduction, Origin of Water, Irrigation in India, Advantages of irrigation, Types of Irrigation systems.

CHAPTER 2 Soil-Water-Plant-Relationships

Introduction, Physical Properties of Soils, Mechanical Composition of Soil, Soil Texture, Soil Structure, Type of Soils, Soil Water Relations, Movement of water into soils, Soil Moisture Retention & Movement, Soil Moisture Tension, Classes & availability of Soil Water, Soil Moisture Constants, Plant Water Relationships, Water Movement along Soil-plant-atmosphere System, Rooting Characteristics, Effective Root Zone and Moisture Extraction Pattern Suitability of Water for Irrigation, Effect of Poor Quality Water on Agriculture & its Management.

CHAPTER 3 Consumptive Use of Water

Water Requirements of Crops, Optimum Use of Water, Factors Affecting Water Requirement of Crops, Duty of Water, Water Requirement by Inductive Method, Water Requirements on Critical Period Concept, Consumptive use of Water Soil Water and Plant Growth, Water Requirement on SoilMoisture, Regime Concept, Water Requirements by Climatological Approach, Effective Rainfall, Modified Penman Method.

CHAPTER 4 Principal Crops in India

Classification of Crops, Principal Crop Seasons, Rotation of Crops and Double Cropping, Brief Description of Main Crops.

CHAPTER 5 Irrigation Efficiencies and Methods of Irrigation

Irrigation Efficiencies, Water Application Efficiency, Methods of Irrigation, Surface Irrigation, Sprinkler or Spray Irrigation, Drip or Trickler Irrigation, Automated Irrigation Systems, New methods of Irrigation.

CHAPTER 6 Planning and Layout of Canal System

Classification of Canals, Commanded Areas, River Discharge, Intensity of Irrigation, Cropping Patterns, Head Discharge and Culturable Commanded area, Channel Losses, Assessment of seepage, Losses from Canals, Alignment of Channels, Capacity of Irrigation Channels.

CHAPTER 7 Design of Channel on Regime Concept

Flow on Open Channels, Design of Channel on Basis of Maxim Permissible Velocity, Kennedy's Silt Theory, Design of Channel on Kennedy Theory, Lacey's Theory, Lacey's Regime Equations, Lacey's Shock Theory, Lacey's Revised Equations, Design of Channel on Lacey's Theory, Other Regime Equations Fitted Equations.

CHAPTER 8 Tractive Force Theory and Sediment Transport

General, Tractive Force Theory, Estimation of Bed Load, Estimation of Suspended Load.

CHAPTER 9 Cross-Section and Slope of Irrigation Channels

Shape of Irrigation Channels, Bed Width and Depth Relationship, Longitudinal Slope, Channel Cross-section, Canal Standards, Reservoir Feed Channels.

CHAPTER 10 Lining of Channels

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CHAPTER 11 Irrigation Outlets

Definition, Classification, Types of Modular Outlets or Rigid Modules, Types of Semi Modules, Types of Non-Modular Outlets, Requirements of a Good Outlet, Criteria of Performance for Modules, Selection of the type of Module.

CHAPTER 12 Regulation & Maintenance of a Channel System

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CHAPTER 13 Ground Water Hydrology

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CHAPTER 14 Irrigation Tubewells

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CHAPTER 16 Drainage of Irrigated Agricultural Lands

Importance and Objective of Drainage, Surface Drainage System, Classes of Drainage, Open or Surface Drains, Required capacity of the Drains, Open Drain Cross-Section, Side Slopes, Disposition of Spoil Closed or Sub-surface Drains, Sub-Surface Drain Depth, Sub-Surface Drainage System, Types of Tile Drainage System, Length and Size

of Tile Drains, Drain Openings, Gravel Envelope for Tile Drain, Spacing of Tile Drains, Steady State formulae-Donan's formula, Hooghoudt's formula, Kirkham's formula, Transient Case-Neal's formulae, Bureau of Reclamation formula, Leaching Requirement.

CHAPTER 17 Water Resources Development

Introduction, History of Water Use, Main Elements in Water Resources Development, Single Purpose, Multi Purpose & Integrated River Basin Development Economy Resulting from Integrated Multi Purpose Development, Basic Principle of a Water Resources Development Policy, International and Interstate Aspects of Basin Development, Availability of Water, National Water Policy.

CHAPTER 18 Hydrology

General, Forms of Precipitation, Measurement, Desired Raingauge Stations in a Catchment and Estimation of Missing Data, Computation of Average Rainfall Over a basin, Run-off, Estimation Run-off, Estimation of Peak Flood, Powell's Method, Gumbel's Method, Ven-te-Chow Method, Regional Flood Studies.

CHAPTER 19 River Behaviour (Control & Training)

River Training and Its Object, River Regions and Characteristics Classification of Rivers on Alluvial Plains, Causes of Meandering, Meander Parameters, Cut-off, Methods for Training of Rivers, Guide Banks, Design Criteria for Guide Bunds, Groynes or Spurs, Design of Repelling Spur, Special Types, Pitched Islands, Bank Protection, Bridge Piers.

CHAPTER 20 Control

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