

# IRRIGATION ENGINEERING

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## ABOUT THE BOOK

This text-book aims at presenting the topics of Irrigation Engineering in a simple manner. Each topic of the book has been arranged in such a way that reader is empowered with in-depth knowledge of the subject. It lays stress on clarity of concepts and enhancement of understanding of design principles of Irrigation Engineering Structures.

The book is arranged into 5 modules and 7 chapters

Module 1: *Chapter 1* gives Introduction of the subject of Irrigation Engineering. It conceptualizes soil water plant relationship and also highlights history of irrigation development in India.

*Chapter 2* is on Water Requirements of Crops.

Module 2: *Chapter 3* covers the topics on the Methods of Irrigation.

*Chapter 4* discusses Irrigation Channels (Canals) and explains procedures for their design.

- Module 3: *Chapter 5* is about Diversion Head Works and gives detailed design procedure for the sloping glacis weir with solved examples.
- Module 4: *Chapter 6* gives Cross Drainage Works including detailed designing of canal transitions.

Module 5: Chapter 7 covers the topic of Canal Regulation Works.

The Appendix I gives University Paper with Answers. In Appendix II Photographs of Cross Regulators and Head Regulators are given. In Appendix III Photographs of Regulation Structures are provided.

At the end of each chapter a summary is provided. The book also contains

- \* 147 Self explanatory and neatly drawn drawings
- \* 61 Numerical problems from past GTU question papers and other numerical problems in each chapter
- \* 39 Useful Tables
- \* 89 Questions at the end of all the chapters.

This book is designed to cover the syllabus of subject of Irrigation Engineering (Subject code: 170602) being taught in the seventh semester of bachelor of civil engineering course under Gujarat Technological University (GTU). The book should also prove to be useful to the Engineering students preparing for the Degree Examinations of all the Indian Universities, having similar syllabus as GTU. Understanding the design principles helps in developing the analytical ability of the reader. It also lays the foundation for becoming a design professional in the field of Irrigation Engineering.

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  - Employment generation (4) Insurance against droughts (2)
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- 1-7. Typical problems
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(4)

- (10) The relationship between duty delta and base period
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  - for flow irrigation (11) Gross command area

(14) Intensity of irrigation

(17) Overlap allowance

(3) Quality of water

- well irrigation Duty of water for tank (12)Culturable command area
  - (13)Culturable cultivated area

(CCA)

- irrigation (5) Crop period
- (6) Base period
- (7) Delta
- (15)Capacity factor (8) Base Period and kor (16) Time factor
- Period
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- 2-3. Irrigation efficiencies
  - Conveyance efficiency (2) Water application efficiency (1)

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- Water storage efficiency (4) Water distribution efficiency (3)
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- 3-6. Sprinkler irrigation

(3)

(1)

(2)

(3)

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Exercise 3

4-1. Introduction

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(1)

(2)

(3)

**Canal Alignment** 

Losses in canals

3-7.

4-2.

4-3.

4-4.

3-6-1. Components of a sprinkler irrigation system

(2) Perforated pipe type sprinkler

Semi portable system

Semi permanent system

(2) Disadvantages of sprinkler irrigation

Comparison of sprinkler and drip irrigation

Based on the nature of source of supply

Based on the soil through which constructed

Based on the lining being provided or not

Classification based on canal alignment

Based on discharge and relative importance in a network

Losses due to transpiration through bank vegetation or weeds

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Based on the function of the canal

**Chapter 4 IRRIGATION CHANNELS (CANAL)** 

Based on financial output

Losses due to evaporation

Losses due to percolations

Classification of irrigation canals

Rotating head type sprinkler

(1) Pumping unit, (2) Pipe networks, (3) Sprinklers

(4) Solid set system

(5) Permanent system

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#### **IRRIGATION ENGINEERING DETAILED CONTENTS**

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berm

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(7) Service road or

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Non-gravity weir

Sloping glacis weir

5-3. Difference between weir and barrage

Parabolic weir

Rock fill weir

Vertical drop masonry weir

Causes of failure of structure on permeable foundations

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Gravity weir

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- Exercise 4

Introduction

Types of weir

5-4. Components of weir

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(1)

(2)

(1)

(2)

(3)

(4)

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5-6.

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