IRRIGATION ENGINEERING

Paper Code: ETCE-403	**L**	**T/P**	**C**
Paper: Irrigation Engineering	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective*: The course deals with various principles and requirements of irrigation scheme involving canals/channels carrying clear or Sediment-Laden water, design of canal sections, sheet pile, cut-off walls, canal fall, distributory head regulator, cross regulator, cross drainage structures, canal head works, dams, spillways, guide bank and bank protection.*

UNIT I

Major and medium irrigation schemes of India, Command area development, Types of Soils and their suitability for irrigation, Root Zone soil water, Irrigation requirements, Irrigation water quality, Irrigation canal system, Duty of water, Canal losses, Estimation of design discharge of a canal, canal outlets, Canal regulation, Water logging, causes, effects and remedial measures.

Alluvial channels carrying clear water and Sediment-Laden water, Evaporation and seepage losses in channels, Cross section of irrigation channels, Berms, Freeboard and service road, Silting of channels.

[T1,T2] [No. of Hours: 11]

UNIT II

Sheet pile cut-off walls, Khosla's theory and its applications, Correction for Floor Thickness, Correction for Mutual Interference of sheet piles, Correction for the slope of the floor, Method for determination of exit gradient, Uplift force on the floor of canal structure.

Canal regulation structures, Canal Fall, Types of canal fall, Cistern element, Vertical/ Horizontal/Inclined-impact Cisterns, No-Impact Cisterns, Roughening measures for energy dissipation such as Friction Block, Ribbed pitching and Provisions such as baffle wall/ deflector/dentated cill etc at the Downstream end of cistern system

Distributary Head Regulator and Cross Regulator and their Design criteria, Control of Sediment Entry into an offtaking channel.

[T1,R2][No. of Hours: 11]

UNIT III

Cross Drainage Structure, their need and types, Head loss through cross drainage structures, Design of Transitions for canal waterway using Hind's Method, Upiri Method and Vittal and Chiranjeevi's method,

Canal Headworks, Selection of the site, Weir or Barrage, Undersluices, Divide Wall, Fish Ladder, Canal Head Regulator, Sediment Excluders and Sediment Ejector, Settling Basin, River Training for Canal Headworks.

[T2,R2][No. of Hours: 11]

UNIT IV

Types of dams, Factors and General Design Criteria for Embankment Dams, Freeboard, Suitability of Foundation, Slope protection, Factors and General Design Criteria for Gravity Dams, Forces on gravity Dam, Causes of failure of a gravity Dam, Stability Analysis of Gravity Dams, Galleries and outlets.

Main components of Spillway, Types of spillways, energy dissipaters, Cavitation erosion on spillway surface

Classification/ behaviour of rivers, Cutoffs, Aggradation and Degradation, River Training and its objectives, River training Methods such as Levees, Spurs, Guide Banks, Design of Guide Bank and Bank Protection.

[T1,T2][No. of Hours: 12]

Text Books:

[T1] G.L Asawa-Irrigation and Water Resources Engineering, New Age Internal Publishers, New Delhi.

[T2] S.K.Garg- Irrigation Engineering and Hydraulic Structures, Khanna Publishers, Delhi

References Books:

[R1] Ralph A.Wurbs, Wisley P.James- Water Resources Engineering, PHI, New Delhi.

[R2] R.K.Sharma and T.K.Sharma- Irrigation Engineering. S.Chand and Company Ltd., New Delhi.

[R3] Satya Narayana Murty Challa-Water Resources Engineering [Principles and Practice] NewAge Intl.

[R5] Applied Hydrology - Ven T Chow, David R Maidment, Larry W Mays, McGraw-Hill, New Delhi

[R6] Bharat Singh, Fundamentals of Irrigation Engineering, Nem Chand and Brothers, roorkee