

## HYDROLOGY AND DRAINAGE ENGINEERING

**Paper Code: ETEN-307**

**Paper: Hydrology and Drainage Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>4</b>

### **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 12.5 marks.

*Objective:*

1. *Introduce students to various methods of estimation and analysis of rainfall and stream flow.*
2. *Use of techniques to assess stream flow and design principles of Dams, Weirs and Barrage, estimation of all parameters and characteristics related to hydrological aspects of catchment studies.*

### **UNIT – I**

**Stream Flow Measurement:** Measurement of stage and velocity, Area velocity method, chemical and Tracer method, Electromagnetic and ultrasound method, indirect methods, Stage discharge relationships.

**Runoff:** Runoff characteristic of streams, Rainfall-runoff correlation, Empirical equations, flow duration curve, flow mass curve, calculation of storage / maintainable demand, Floods and Droughts, causes and management.

**Hydrographs:** Hydrograph and its components, basic flow separation techniques, effective rainfall, Unit hydrographs, concept of time invariance and linear response, Applications and derivation of unit hydrographs, complex storm, Unit hydrograph of different durations, methods of superposition and S-curve, Uses and limitations of unit hydrographs.

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

### **UNIT – II**

**Floods:** Computations of peak floods by empirical formulae, by rational method and by unit hydrograph method, frequency analysis of floods and droughts, flood routing principles, reservoir routing.

Interception and Depression Storage, Evaporation and Transpiration, Evapotranspiration, Estimating Evapotranspiration.

**Infiltration:** Horton's Infiltration Model, SCS Runoff Curve Number Procedure.

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

### **UNIT – III**

Alignment of canals, Distribution system for canal irrigation, Design of canals and conduits, Design of lined irrigated channels.

**Reclamation of water logged and saline soils for agricultural purposes:** Causes of water logging, water logging control, Reclamation of saline and alkaline lands, Land drainage.

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

### **UNIT – IV**

**Rainfall:** Measurements by rain gauges, Design of rain gauges network, Average annual rainfall and index of wetness, Mean rainfall over a drainage basin.

**Dams, Weirs and Barrages:** Types of and their preliminary design principles, Spillways and energy dissipaters, Outlet works through dams and river intakes, Weirs and barrages, Cross- drainage and drop structures, Regulating and silt control structures. Reservoir sedimentation.

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

### **Text Books:**

[T1] Subramanya K. , "Engineering Hydrology" Tata McGraw Hill Publishing Company Ltd., New Delhi.

[T2] Garg S.K., "Irrigation Engineering and Hydraulic Structures," Khanna publishers, New Delhi.

### **Reference Books:**

[R1] Asawa G.L., "Irrigation and Water Resource Engineering", New Age International (P) Ltd.

[R2] Raghunath H.M., "Hydrology" New Age International (P) Ltd., New Delhi.

[R3] Todd D.K., "Groundwater Hydrology", Willey India (P) Ltd., New Delhi.

[R4] Jain, "Hydrology and Water Resources of India", CBS Publishers and Distributers (P) Ltd., New Delhi.