

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 one question from each unit.

UNIT – I

Streamflow measurement: Measurement of stage and velocity, Area velocity method, chemical & 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.

[No. of Hours: 10]**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 & Depression Storage, Evaporation & Transpiration, Evapotranspiration, Estimating Evapotranspiration.

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

[No. of Hours: 11]**UNIT – III**

Irrigation Engineering, Techniques of water distribution in the farms, Duty & delta of a crop, Crop seasons & Indian agriculture, Irrigation efficiencies, Consumptive use, Soil-Moisture-Irrigation relationship, Alignment of canals, Distribution system for canal irrigation, Design of canals and conduits, Design of lined irrigated channels.

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

[No. of Hours: 10]**UNIT – IV**

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

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

Flood control & river training: Different causes of flood, Methods of flood control, Reservoir sedimentation & control, Introduction to river mechanics, River training works.

Drainage engineering: Types of drainage systems, Their layouts, Urban sanitary & storm water, Sewers, Design of sewers, Agricultural land drainage, Design of surface & subsurface drains, Road & airport drainage.

[No. of Hours: 11]**Text and Reference Books:**

1. S.K. Mujumdar, "Irrigation Engineering", TMH.
2. Santosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures," Khanna publishers, Delhi.
3. G.L. Asawa, "Irrigation and Water Resource Engineering", New Age International Publishers.
4. Satya Narayan Murthy Challa, "Water Resource Engineering", New Age International Publishers.
5. K.C. Patra, "Hydrology".
6. H.M. Raghunath, "Hydrology" New Age International Publishers.
7. D.K. Todd, "Groundwater Hydrology", John Willey.
8. C.W. Fetter, "Applied Hydrology", CBS.
9. Jain, "Hydrology and Water Resources of India", CBS.