

Syllabus for M.Tech Admission Test (MTAT) : 2024

CIVIL ENGINEERING

DESIGN OF CIVIL ENGINEERING STRUCTURES

1. **Fluid Mechanics, Open Channel Flow and Hydrology, Water Resources and Engineering:**

1.1 Fluid Mechanics: Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curved surfaces. Kinematics and Dynamics of Fluid flow: Velocity and accelerations, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions. Continuity, momentum and energy equation, Navier-Stokes equation, Euler's equation of motion, application to fluid flow problems, pipe flow, sluice gates, weirs. Dimensional Analysis, Laminar flow between parallel, stationary and moving plates, flow through tube. Boundary layer: Laminar and turbulent boundary layer on a flat plate, laminar sub layer, smooth and rough boundaries, drag and lift. Turbulent flow through pipes: velocity distribution and variation of pipe friction factor, hydraulic grade line and total energy line

1.2 Open channel flow: Uniform and non-uniform flows, specific energy and specific force, critical depth, rapidly varied flow, hydraulic jump, gradually varied flow, classification of surface profiles,

1.3 Hydrology: Hydrological cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrograph.

1.4 Irrigation Engineering: Water requirements of crops: consumptive use, duty and delta, irrigation methods and their efficiencies. (ii) Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, cross drainage works

2. **Geotechnical Engineering:** Soil Type and structure - gradation and particle size distribution - consistency limits. Water in soil - capillary and structural - effective stress and pore water pressure - permeability concept - field and laboratory determination of permeability - Seepage pressure - quick sand conditions - Shear strength determination - Mohr Coulomb concept. Compaction of soil - Laboratory and field tests. Compressibility and consolidation concept - consolidation theory - consolidation settlement analysis. Earth pressure theory and analysis for retaining walls, Bearing capacity of soil - approaches for analysis - Field tests - settlement analysis - stability of slope. Subsurface exploration of soils, Pile and well foundation.

3. **Structural Analysis, Design of structures:**

3.1. Structural Analysis: Shear force & bending moment, Lami's theorem, Castigliano's theorems I and II, unit load, Method of consistent deformation applied to beams and pin jointed trusses, Rolling loads and Influences lines: Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending Moment in beams

traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses. Slope deflection, moment distribution,

3.2 Structural Steel Design: Structural Steel: Bolted and welded joints and connections. Tension and compression member,

3.3 Structural Design : Concept of mix design. Reinforced Concrete: Working stress and Limit State method of design-Recommendations of I.S. codes One way and two way slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity,

4. Building Materials :

Basic Physical Properties. types, classification and various Physical laboratory tests of

Cement, Bricks, Stone aggregate, Timber and steel.