

**Annexure-1 to Advt. No. IMU-HQ/R/NT/2023/01 dated 03.02.2023**

**Syllabus for Domain Knowledge – Assistant Engineer (Civil)**

**Building Materials:**

Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminium, Fly Ash, Basic Admixtures. Timber, Bricks and Aggregates: Classification, properties and selection criteria; Cement: Types, Composition, Properties, Uses, Specifications and various Tests: Lime & Cement Mortars and Concrete: Properties and various Tests: Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

**Solid Mechanics:**

Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion.

**Structural Analysis:**

Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses: Analysis of determinate and indeterminate structures; Trusses, beams, plane frames: Rolling loads. Influence Lines, Unit load method & other methods: Free and Forced vibrations of single degree and multi-degree freedom system: Suspended Cables: Concepts, and use of Computer-Aided Design.

**Design of Steel Structures:**

Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam-column connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

**Design of Concrete and Masonry structures:**

Limit state design for bending, shear, axial compression and combined forces; Design of beams. Slabs, Lintels, Foundations, Retaining walls, Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

**Geo-technical Engineering and Foundation Engineering:**

Soil exploration - planning & methods, Properties of soil, classification, various tests and interrelationships: Permeability & Seepage, Compressibility, consolidation and Shearing resistance. Earth pressure theories and stress distribution in soil; Properties and uses of geo-synthetics.

Types of foundations & selection criteria, bearing capacity, settlement analysis, design and testing of shallow & deep foundations: Slope stability analysis. Earthen embankments. Dams and Earth retaining structures: types, analysis and design, Principles of ground modifications.

**Transportation Engineering:**

Planning & construction methodology, Alignment and geometric design: Traffic Surveys and Controls: Principles of Flexible and Rigid pavements design.

**Fluid Mechanics:**

Fluid properties: Dimensional Analysis and Modeling: Fluid dynamics including flow kinematics and measurements: Flow net: Viscosity. Boundary layer and control, Drag. Lift, Principles in open channel flow. Flow controls. Hydraulic jump: Surges: Pipe networks.

**Hydrology and Water Resources Engineering:**

Hydrological cycle. Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging: River morphology: Flood, drought and their management; Capacity of Reservoirs.

Multipurpose uses of Water, River basins and their potential: Irrigation systems, water demand assessment; Resources storages and their yields; Waterlogging, canal and drainage design, Gravity dams, falls, weirs. Energy dissipaters, barrage distribution works, Cross drainage works and head-works and their design: Concepts in canal design, construction & maintenance: River training, measurement and analysis of rainfall.

**Environmental Engineering and Water Supply Engineering:**

Sources, Estimation, quality standards and testing of water and their treatment; Rural, Institutional and industrial water supply: Physical, chemical and biological characteristics and sources of water, Pollutants in water and its effects, Estimation of water demand: Drinking water Standards, Water Treatment Plants. Water distribution networks.

**Surveying:** Classification of surveys, various methodologies, instruments & analysis of measurement of distances, elevation and directions; Field astronomy. Global Positioning System: Map preparation: Photogrammetry: Remote sensing concepts: Survey Layout for culverts, canals, bridges, road/railway alignment and buildings, Setting out of Curves.

**Construction Practice. Planning and Management:**

Construction – Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works: Tendering Process and Contract Management. Quality Control. Productivity, Operation Cost; Land acquisition: Labour safety and welfare.