

JUNIOR TECHNICIAN (CIVIL)

Strength of materials:

Stresses, strains, Hooke's law & elastic constants, stress-strain relationship; Principal stress and strain - Mohr's circle method; Types of loads and different support conditions, determination of SF and BM in simple beams under different loading systems; Calculating geometrical properties - centroid, moment of inertia for sections of different shapes; Simple beam bending theory, bending stress distribution in beams, columns-crippling load, combined stresses

Building materials and construction:

Different construction materials (stone, brick, cement, steel rebar) and their physical properties; preparation of mortar and cement concrete. Laboratory test setup and procedure for evaluating the physical properties: tensile strength on mild steel bars, bending test on simply supported beams, initial and final setting time of cement, fineness, normal consistency, soundness of cement, workability of concrete, compression tests on bricks and cubes, determination of flakiness index, fineness modulus of fine and coarse aggregate and water absorption in bricks & pressed tiles.

Buildings - stone masonry & brick masonry, different types of foundations, floors and roofs

Surveying:

Plane surveying, Chain, compass, levelling, theodolite surveying, GPS and Total station

Hydraulics and hydraulic machines:

Fluid statics – measurement of pressure using manometers; Determination of friction losses in pipes; Flow measurement in pipes using venturimeter and orificemeter; Flow measurement in channels – using rectangular and V-notches. Basics of centrifugal pumps;

Soil mechanics and foundation:

Origin of soil; Phase diagram; Definitions: void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters; Grain size distribution curves and their uses; Index properties of soils; Atterberg's limits; Classification of soils and plasticity chart; Permeability of soil: coefficient of permeability, determination of coefficient of permeability; Effective stress; Quick sand; Consolidation of soils: principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e-log p curve; Shear strength of soils, direct shear test. Soil compaction: Maximum dry density and optimum moisture content, Determination of field density of soils,

Relative compaction, laboratory and field compaction tests; Plate load test; Standard penetration test; Type of footings.

Transportation Engineering

Construction of road/highway and railways, laboratory tests on bitumen: penetration, softening point (ring and ball), rotational viscosity, kinematic viscosity, abrasion test on aggregates, evaluation of aggregate crushing & impact value, Marshall mix design, bulk specific gravity, theoretical maximum specific gravity, California Bearing Ratio test.

Structural Design:

Analysis and design simple RCC elements like singly / doubly reinforced rectangular beams for shear and flexure by limit state method; Design One way/ Two way slabs and Staircases by limit state method; Design Axially loaded Columns and Footings by limit state method; Design simple Steel members like Laterally supported Beams, Tension members, Compression members and Welded connections by working stress/ limit state method.

Environmental Engineering

Water supply - demand requirements; Quality of water- standards for drinking water, physical and chemical examination of water- sampling, physical and chemical test; Microbiological examination of water- sampling, preservation and storage, and testing, MPN; Water treatment – physical and chemical process; Domestic wastewater – wastewater characteristics, determination of solids; Sewage treatment –primary, secondary and tertiary treatment.