राष्ट्रीय प्रौद्योगिकी संस्थानश्रीनगर
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR
(An autonomous Institute of National Importance under the aegis of Ministry of Education, Govt. of India)
हजरतबल, श्रीनगर, जम्मू-कश्मीर, 190006,भारत
Hazratbal, Srinagar Jammu and Kashmir, 190006, INDIA

SYLLABUS FOR TECHNICAL ASSISTANT

(Department of Civil Engineering)

GENERAL APTITUDE SYLLABUS

Verbal Aptitude: Basic English grammar: tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech Basic vocabulary: words, idioms, and phrases in context Reading and comprehension Narrative sequencing
Quantitative Aptitude: Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series Mensuration and geometry Elementary statistics and probability
Analytical Aptitude: Logic: deduction and induction; Analogy Numerical relations and reasoning
Spatial Aptitude: Transformation of shapes: translation, rotation, scaling, mirroring, assembling, and grouping Paper folding, cutting, and patterns in 2 and 3 dimensions.

CIVIL ENGINEERING SYLLABUS

ENGINEERING MECHANICS: Forces and moments- Vectors and scalars, resultant forces at a point, types of supports, types of loading. Centroid – rectangle, triangle, parallelogram, circle, semicircle, trapezium. Location of centroid of T, L, I, channel, Z sections. built-up sections. Moment of Inertia – T, L, I and built up sections, radius of gyration of built-upsections; Polar moment of inertia of solid and hollow circular sections using perpendicular axis theorem only. Simple stresses and strains - ductile materials-Mechanical properties of materials Hooke‘s law - lateral strain-Poisson‘s ratio-Elastic constants and the relation between them Composite sections-Resilience-Strain energy-Gradual and sudden loading.
STRENGTH OF MATERIALS: Shear force and Bending Moment Diagrams for cantilever, simply supported, fixed, continuous and overhanging beams subjected to Point loads and UDL. Theory of simple bending-assumptions-bending equation-bending stresses-Section Modulus-Shear stress distribution across various sections like rectangular, circular and I -sections-Torsion-solid and hollow circular shafts subjected to pure torsion – shear stress –distribution in shafts – power transmitted by circular shafts. Deflection of cantilevers and simply supported beams by Double Integration method and Deflection of simply supported beams by Macaulay‘s method – For Mohr‘s theorems for slope sand deflections-Moment area method- Columns and struts-types-slenderness ratio- Euler‘s and Rankine‘s formulae for axial loading.
REINFORCED CONCRETE STRUCTURES: Grades of concrete, characteristic strength, Modulus of Elasticity-I.S.456-2000- Philosophy of Limit state design. Limit state of Strength and Serviceability, partial safety factor-design strength of materials and design loads assumptions. Analysis and Limit state design of rectangular beams-Singly, Doubly reinforced and T-beams. Shear in RCC beams, lintels and sunshades - Development length. Slabs-analysis and limit state design of one-way and two-way slabs as per IS.456-2000. Torsion reinforcement. Design of continuous slabs and beams - Deflection check for slabs and beams. Detailing of reinforcement in singly reinforced and doubly reinforced simply supported beams of rectangular sections and lintels, one way and two-way slabs.
Columns: Codal provisions of I.S 456-2000 - short and long columns-different shapes-design of short columns by limit state method-long columns- concept, effective length for different end conditions. Footings-Isolated column footings-one way shear and two way shear. Stairs - types, loads on stairs.

राष्ट्रीय प्रौद्योगिकी संस्थानश्रीनगर
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR
(An autonomous Institute of National Importance under the aegis of Ministry of Education, Govt. of India)
हजरतबल, श्रीनगर, जम्मू-कश्मीर, 190006,भारत
Hazratbal, Srinagar Jammu and Kashmir, 190006, INDIA

Working stress method of design: Basic principles, neutral axis, lever arm-Design and analysis of Singly reinforced simply supported rectangular beams. Comparison of Limit state and Working stress methods.

SURVEYING: Chain surveying - purpose and principle - errors and corrections different operations in chain surveying- obstacles - methods of calculation of area. Compass Surveying - purpose and principle - bearings- traversing using prismatic compass- local attraction - errors. Levelling - definitions - component parts - errors - Methods of levelling -contouring - characteristics and methods. Theodolite - principles and component parts fundamental lines and relationship among them - adjustments of theodolite - measurement of horizontal and vertical angles - errors-traverse computations - Bowditch and Transit rule. Tacheometry - principle - stadia tacheometry - tangential tacheometry, Principle and uses of E.D.M, Electronic Theodolite, Total Station, Global positioning System - Importance, G.I.S –Use and applications in Civil Engineering, Curves - simple curves, elements of simple curve, setting out of simple curves by chain & tape, single & double theodolite method.

HYDRAULICS: Fluid properties - specific weight – mass density-specific gravity -surface tension - capillarity-viscosity. Atmospheric pressure, gauge pressure and absolute pressure. Fluid pressure on plane surfaces - Centre of pressure, measurement of fluid pressure using piezometer and manometers. Types of flows-uniform, non-uniform, steady, unsteady, laminar and turbulent flows. Energies of liquid in motion - continuity equation. Bernoulli'stheorem - Pitot tube - Venturimeter. Flow thorough small and large orifices, free orifices, submerged orifices, coefficients of orifices - Cc, Cv and Cd. Flow through internal, external, convergent and divergent mouthpieces. Types of Notches - rectangular and triangular, flow overnotches. Types of Weirs- sharp crested and broad crested-mathematical formulae for discharge Francis and Bazin. Flow through pipes-major and minor losses - Chezy's and Darcy's formulae for loss of head due to friction-HGL & TEL - Reynold's number for laminar and turbulent flows. Flow through open channels-rectangular and trapezoidal - chezy's formula for discharge - Kutter's and Manning'sequation for Chezy's constants-Most economical sections. Reciprocating and Centrifugal pumps(without problems). Classification of Turbines - Kaplan, Francis and Pelton wheel (without problems) - use of Draft tube. Hydro-electric installations - components and uses.

IRRIGATION ENGINEERING: Necessity of Irrigations - Perinnial and inundation Irrigation, Flow and Lift Irrigation, Principal crops - kharif and rabi seasons - Duty, delta and base period. Methods of Irrigation - check flooding, basin flooding, contour bunding, furrow, sprinkler and drip Irrigations. Hydrology - Rainfall, types of Rain gauges, types of catchments-rainfall and runoff. Measurement of velocity of flow in streams-Ryve's and Dicken's formulae for computing maximum flood discharge. Classification of Head works – component parts of diversion head work. Weirs and Barrages. Percolation and uplift pressures. Types of Reservoirs - dead storage, live storage and surcharge storage. Storage Head works-different types of dams-rigid and non-rigid dams- gravity dams-low and high dams. Elementary profile of a dam. Failures of gravity dams - drainage galleries. Ogee and siphon spillways. Earth dams - types, failures and precautions. Phreatic lines and drainage arrangements in earthen dams. Distribution works-classifications and alignment of canals-typical cross section of a canal-berm and balanced depth of cutting- canal lining. Cross drainage works – types and functions.

राष्ट्रीय प्रौद्योगिकी संस्थानश्रीनगर
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR
(An autonomous Institute of National Importance under the aegis of Ministry of Education, Govt. of India)
हजरतबल, श्रीनगर, जम्मू-कश्मीर, 190006,भारत
Hazratbal, Srinagar Jammu and Kashmir, 190006, INDIA

TRANSPORTATION ENGINEERING: Importance of transportation engineering– I.R.C. – Classification of roads as per I.R.C., recommended I.R.C. values of camber for different roads. Gradients – Ruling gradient, limiting and exceptional gradient Recommended I.R.C values of gradients, Different systems of classification of soils – Textural classification – IS classification of soils, Bearing capacity – importance in foundation design. Highway surveys and Traffic Engg.- Traffic census and its importance, Road intersections Traffic signs- Informatory signs- Mandatory signs, Cautionary signs. Highway constructions and Maintenance - Purpose of road drainage- surface and sub-surface drainage, Typical cross section of highway in cutting and embankment. Water bound macadam roads, Cement concrete roads. Permanent way of Railways, Importance of Railways- Gauge, Types of gauges, Structure of permanent way –different types of rails, requirements of a good rail, Sleepers- functions, Types of sleepers, characteristics of a good sleeper –spacing of sleepers-sleeper density.

WATER SUPPLY AND SANITARY ENGINEERING: Environment andEcology- Ecology and Ecosystem, Quality of water, Need for protected water supply, Totalquantity of water for a town, per capita demand and factors affecting demand, Forecastingpopulation by arithmetical, geometrical and incremental increase methods, Sources andconveyance of water: surface sources, underground sources, Types of Intakes. Quality andMethods of purification of water.Distribution System: Methods of supply, Storage- underground and overhead-service reservoirs,Types of layout- dead end, grid, radial and ring system their merits and demerits and theirsuitability. General layout of water supply arrangements in buildings.System of sewage disposal-types of sewerage systems, Quantity of discharge in sewers, dryweather flow, variability of flow. Different shapes of cross-section for sewers, Strength ofsewage, sampling of sewage, characteristics of sewage - Characteristics of Industrial wastewater-principles of treatment, Preliminary treatment, secondary treatment. Sewers – sewerappurtenances- shapes, merits and demerits.