

Final Syllabus
Syllabus and Scheme of Examination for the Post of
Junior Engineer (Civil)

Reference: Advertisement No. IIT Mandi/Recruit./NTS/2025/03 dated 14.08.2025

There will be two-stage examination.

Stage I: Written Examination (Objective type- MCQ) – 02 hours

Stage II: Skill/Trade Test

Syllabus for Written Examination

Building Materials: Physical and chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. Building stones, silicate-based materials, cement (Portland), asbestos products, timber and wood-based products, laminates, bituminous materials, paints, varnishes.

Estimating, Costing and Valuation: Estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, items of work – earthwork, brick work (modular & traditional bricks), RCC work, shuttering, timber and wood work, painting, flooring, plastering, boundary wall, brick building, water tank, septic tank, bar bending schedule, centre line method, mid-section formula, trapezoidal formula, Simpson's rule. cost estimate of septic tank, flexible pavements, tube well, isolates and combined footings, steel truss, piles and pile caps. valuation – value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of evaluation.

Surveying: Principles of surveying, measurement of distance, chain surveying, working of the prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, levelling, definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of a contour map, tachometric survey, curve setting, earthwork calculation, advanced surveying equipment.

Soil Mechanics and Foundation Engineering: 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, IS soil classification and plasticity chart. permeability of soil, coefficient of permeability, determination of coefficient of permeability, unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e-log p curve, computation of ultimate settlement. shear strength of soils, direct shear test, vane shear test, triaxial test. soil compaction, laboratory compaction test, maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, bearing capacity of soils, plate load test, standard penetration test.

Hydraulics Engineering: Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines. hydrology – measurement of rainfall, run off coefficient, rain gauge, shallow and deep wells, yield from a well, silting and scouring in channels, Kennedy's theory of critical velocity. Lacey's theory of uniform flow, definition of flood, causes and effects, methods of flood control, water logging, preventive measure. land reclamation, purposes, methods, description of land and reclamation processes.

Transportation Engineering: Highway engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, design of flexible and rigid pavements – water bound macadam (WBM) and wet mix macadam (WMM), gravel road, bituminous construction, rigid pavement joint, pavement maintenance, highway drainage, traffic engineering – traffic signals, operation, traffic signs and markings, road safety.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. surface water drainage. solid waste management – types, effects, engineered management system. air pollution – pollutants, causes, effects, control. noise pollution – cause, health effects, control.

Strength of Materials and structures: Concepts of stress and strain, stress-strain characteristics of ductile and brittle materials, elastic constants and their relationships, composite section, thermal stresses. Analysis of truss – determinate and indeterminate truss, method of joints and method of sections, deflection in truss. Analysis of beams - shear force and bending moment in determinate beams, simple bending theory, bending stress, shear stress distribution, torsion of circular shafts. method of double integration, moment-area and unit load methods, principle of superposition. Analysis of columns - Euler's theory for columns, critical load for different end conditions of column.

Concrete Technology: Properties, advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

Design of Structures: RCC design - concept of limit state and working stress methods for design, design of singly reinforced and double reinforced RCC beams, relevant IS guidelines for design strength for flexural, shear, bond strength Analysis and design of one-way and two-way slabs, design of isolated footings, reinforced brick works, design of columns, design staircases, design of retaining wall, design of water tanks, detailing of RCC sections. Steel design –design of steel columns, beams roof trusses and plate girders.

Office Work Knowledge: Construction management, time scheduling using CPM and PERT, quality management and safety, bill processing, knowledge of tendering process and different types of contracts. hands on experience in daily usage software like word, excel, PowerPoint, AutoCAD and other civil engineering related technical software etc., legal and ethical aspects in construction.

General Knowledge: General awareness, general aptitude and reasoning.

Important Instructions for candidates:**General information about the exam:**

- The MCQs have negative marking for wrong answers.
- The unanswered questions will not be considered for evaluation. (i.e., no marks will be awarded for any question not attempted).
- Only one best-suited answer has to be given for any MCQ. More than one answer will be treated as wrong answer.
- Use of only blue or black ballpoint pen is permitted to answer the questions and fill the form in the exam hall. Use of ink pen/gel pen/pencil/whitener is not permitted.
- Use of calculator, cell phones, log book, periodic table, and any type of electronic device etc., are strictly prohibited.
- The medium of instruction/answers will be English only.
- Involvement in any malpractices will lead to disqualification
- Any additional instructions given during the selection process must be adhered/complied.

Final Selection:

- Based on the performance of Stage-I, the Stage-II examination may be conducted for candidates, as decided by the selection committee.
- Final selection will be made on the scores obtained in the Stage-I, as the Stage –II is of qualifying nature. But if a candidate fails to qualify in Stage-II, her/his candidature will not be considered further.
- Please note that for consideration in the merit list, a candidate has to secure minimum marks fixed by the selection committee in both exams at Stage-I and Stage-II – failing which institute will not make an offer of appointment even if vacancies go unfilled.