

Junior Engineer (Civil)

Stage-I (Screening Test)

Stage-I (Screening Test): A screening test shall be conducted in the first phase in form of multiple choice written test. Written test shall be of **90 minutes'** duration comprising of **75 questions**. Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Screening test shall consist of questions on **General English**(Tenses, Active and Passive, Direct and Indirect speech, Punctuation, Correction of sentences, One word substitutes, Modals, Articles, Clauses, Synonyms, Antonyms, Idioms and Phrases); **Numerical Aptitude Arithmetic**(Simplification of Fractions, Simple and Compound Interest, Profit and Loss, Percentage, Averages, Number System, Time and Work, Problems on Trains, Calendar, Area, Problems on Numbers, Square root, Cube root, Time and Distance and Other basic Arithmetic related matters);**Reasoning and Data Interpretation** (Number Series Compilation, Missing Number finding, Pattern series, Direction Sense Test, Series Compilations, Classification, Missing Character finding, odd man out, Blood relations, Analogy, Coding and Decoding, Letter and Symbol Series, Verbal reasoning, Statement and Conclusions, Letter and Symbol Series, Logical Problems, Arithmetic reasoning, Logical Sequence of words, Pie Chart and Bar Chart).

Eligible candidates **Ten Times** of the positions in each category will be screened for the Stage-II subject to the fulfillment of all educational qualification etc. as per the Recruitment Rules-2019.

Stage-II (Skill test)

Stage-II (Skill Test): The skill test will be of qualifying nature.

Laboratory Experiments etc. as per nature of the post shall be conducted in the respective laboratories/field. Minimum qualifying marks in the skill test will be [UR:30%; EWS:27%; OBC:27%; SC;20%; ST:20%; PwD:15%].

The candidates, who will qualify the skill test, will be called for the final written test. The Candidates appearing in the written test must ensure their eligibility for the particular category of post. The documents in support of their eligibility shall be verified before the Final test. If any candidate will not have requisite qualification etc. as per the post for which he is appearing will not be allowed to sit in the final test (Stage-III).

Stage-III (Final test)

Stage-III (Final Test): Final written test shall be of 2 hours duration comprising of 100 multiple choice questions.

Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Only those who are screened in after the Screening test [Stage –I] and qualify the Skill Test [Stage-II] will be allowed to appear in the Final Test [Stage III]. The minimum passing marks in Final test will be [UR:30%; EWS:27%; OBC:27%; SC;20%; ST:20%; PwD:15%].

The final merit list shall be drawn on the basis of the stage-III written test.

SYLLABUS FOR SKILL TEST AND FINAL WRITTEN TEST IS AS PER ANNEXURE-IV.

Junior Engineer (Civil)

Syllabus for the Skill test (Junior Engineer Civil)

Strength of Materials: Conduction of tests on steel

Concrete Technology: Tests on cement, sand and concrete

Geotechnical Engineering: Conduction of basic tests on soil

Surveying: Conduction of different types of surveying and leveling; Use of Total Station

Highway Engineering: Tests on bitumen and aggregates

Environmental Engineering: Basic Tests to be carried out on water and waste water

Junior Engineer (Civil)

Syllabus for Final Written test for the post of Junior Engineer (Civil)

Knowledge pertaining to the various instruments/ equipment in different laboratories (structures testing, concrete technology, transportation engineering, geotechnical engineering, environmental and fluid mechanics and hydraulics laboratories of the Department). The skill test includes introduction of these instruments/ equipment, methodology of operation thereof, knowledge of the conduction of these tests, etc.

Computer awareness

Basic knowledge of Computer Applications, viz; MS Word, MS Excel, Power Point etc. Internet, MS-DOS, Computer Generation & Development, UNIX, Windows, Lotus, Smart Suite, Data Entry, Knowledge of Software, Networking Platforms, applications of computers in electrical engineering

Awareness about NIT Acts and Statutes

Knowledge of NIT Act and Statutes and amendments issued from time to time, Basic knowledge of relevant General Financial Rules and RTI Act.

Civil Engineering

Strength of Materials

Systems of forces. Centroids and moment of inertia. Mechanical properties of engineering materials - elastic constants. Different types of stresses and strains. Shear force and bending moments in beams. flexural and shear stresses in beams.

Design of Concrete and Steel Structures

Basics of working stress and limit state method. Analysis and design of simple RCC elements using working stress method. Analysis and design of RCC elements like singly / doubly reinforced rectangular beams - singly reinforced T-beams (Cantilevers, Simply supported/ Continuous beams, Lintels etc.) for shear and flexure by limit state method. Design of 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 limit state method.

Theory of Structures

Slope and deflection of determinate beams by double integration. Macaulay's method; conjugate beam method, moment area method and unit load method. Analysis of propped cantilevers and fixed beams by Area - Moment method and draw SFD, BMD. Analysis of Continuous beams by Theorem of Three moments. Analysis of continuous beams and Portal frames by Moment Distribution Method and Slope Deflection Method; BMD and SFD for such structures.

Construction Materials and Construction Practice

Different construction materials and their properties - different types of cement - grades of cements - tests on cement and other construction materials. Types of modern building materials such as ceramic products – glass - metals and plastics. Preparation of mortar and cement concrete. Different types of concretes. Types of foundations. Classification of stone masonry - brick masonry. Types of doors – windows - lintels - stairs. Types of floors - roofs. Different methods of pointing, plastering and termite proofing. Scaffolding - shoring - underpinning - form work. Procedure of colour washing - white washing - painting - varnishing.

Soil Mechanics and Foundation Engineering

Development of Soil Mechanics - Soil formation - three Phase System - Index and Engineering properties. Compaction and consolidation. Permeability - Darcy's law. Shear strength of soil - Mohr's stress circle - Mohr-Coulomb failure theory - Shear strength test - Unconfined compression test - Optimum moisture content - Proctor's Compaction test. Soil exploration - Direct, Semi-direct and Indirect methods - Spacing and depth of test borings - Sub-Soil Sampling - Disturbed and Undisturbed samples - Seepage analysis - Head, Gradient and Potential - Hydraulic gradient - Seepage pressure. Methods of determining bearing capacity - Types of failure in soil; Rankine's analysis - Terzaghi's analysis - Effect of water table. Settlement of foundation - Plate load test.

Surveying

Levelling. Types of Theodolites - Transit and non-transit Theodolite, Vernier and Micrometer Theodolites, Measurement of vertical angle and deflection angle – Bearing of a line – Theodolite traversing. Stadia and Tangential tacheometry – Fixed hair method of tacheometry – Measurement of distance and elevation. Contouring. Total station.

Highway Engineering

Development of Roads in India - Modes of transportation - Nagpur Plan,

Classifications of Highways, Highway materials and its evaluation. Types of Pavement - Flexible and Rigid Pavements - Parking - Methods of parking - Road junctions (Grade intersections and Grade separators) - Traffic signals - Types of road signs. Classifications of roads - Earthen road, Gravel road, Water Bound Macadam roads, Types of Bituminous roads - Surface dressing, Methods of construction of cement concrete roads. Rehabilitation and maintenance of roads.

Estimating and Costing

Types of Estimates - Approximate and Detailed Estimates- Main and Sub Estimates- Revised Estimates-Supplementary Estimates – Maintenance/Repair Estimates. Taking off Quantities. Approximate Estimates – Service Unit method- Plinth Area method- Carpet Area method- Cubical Content method. Computation of Areas and volumes of Irregular and irregular Sections - End Ordinate rule, Mid Ordinate rule, Average Ordinate rule, Trapezoidal rule, Simpson's rule. Determination of Volume of Earth work in Embankment / Cutting with level sections of varying heights/ depths. Analysis of Rates - Cement/Lime mortars; Plain Cement Concrete in Foundation/Leveling Course; Flooring with cement concrete, plastered with cement mortar; Flooring with PCC finished with cement concrete surface; Flooring with Cuddapa slabs.

Water Resources Engineering

Pressure of liquid at a point - Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure – Measurement of pressure - Simple mercury barometer - Pressure measuring devices and problems - Piezometer tube - Simple U-tube manometer - Differential manometer – Micrometer. Hydrostatic pressure - Pressure on plane surfaces - Horizontal, vertical and inclined Surfaces- Total Pressure-Centre of pressure - Depth of centre of pressure. Various types of flows including Laminar and turbulent flow - Steady and unsteady flow – Uniform and Non-uniform flow - Bernoulli's theorem – Venturimeter – Orificemeter. Large orifice – Discharge formula –Types of mouthpieces - Losses of head in pipes - Types of notches and problems –Classification of weirs - Discharge over a rectangular weir and trapezoidal weir, End contractions of a weir. Rectangular and Trapezoidal channels – Discharge – Chezy's formula, Bazin's formula and Manning's formula - Methods of measurement of velocity. Flow through pipes.

Methods of Irrigation- Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relationship and soil fertility, sprinkler Irrigation – advantages & limitations, Planning and design of sprinkler irrigation, Drip irrigation – advantages &

limitations, suitability.

Canal Irrigation: Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages. Silt theories – Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories, suspended and bed loads.

Environmental Engineering

Water supply - Public water supply system and demand - types of demand - per capita demand - prediction of population. Intakes - types of intakes-description of intakes-infiltration galleries and infiltration wells in river beds - necessity of pumps - types of pumps - pipes for conveyance of water. Water treatment - sedimentation –types of sedimentation - coagulation - coagulants and their choice -types of sedimentation tanks – filtration - R.O process. Distribution system - gravity, pumping and combined system. Sanitary Engineering - estimation of storm water – minimum size and shape of sewer - materials used for sewer - joints - laying and testing - manhole - lamp hole - catch basin - street inlet - grease and oil trap -flushing tanks – drainage arrangements in buildings - sanitary fittings - sewage pumps. Sewage treatment - primary and secondary treatments - screens - skimming tanks -grit chambers - sedimentation tanks – filters - types and description of filters - activated sludge process - septic tanks - construction and working of septic tanks. methods of solid waste disposal - incineration, dumping, sanitary landfill, composting - energy from waste.