

Written examination for the post of Junior Engineer (Civil)

Qualification:

1. Licentiate of Civil Engineering (L.C.E.) or Diploma in Civil Engineering or equivalent and above.

Syllabus for written examination

1	Civil Engineering	300 marks
2	General Knowledge	50 marks
3	English	50 marks
	Total	400 marks
Viva- Voce		50 marks

Syllabus for written examination for the post of

Junior Engineer (Civil)

Qualification:

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A Subject

Objective Type Questions and Subjective type questions . **Syllabus**

1. Strength of Materials:

Simple Stress and Strain, Elastic constants, axially loaded compression members. Shear force and bending moment, theory of simple bending. Shear Stress distribution across cross sections, Beams of uniform strength. Deflection of beams Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method. Elastic stability of columns, Euler's, Rankine's and Secant formulae.

2. Engineering Materials:

Physical properties of construction materials with respect to their use in construction - Stones, Bricks and Tiles; Lime, Cement, different types of Mortars and Concrete.

Specific use of ferro cement, fibre reinforced CC, High strength concrete.

Use and selection of materials for specific use like Low Cost Housing, Mass Housing, High Rise Buildings.

Timber: Different types and species of structural timber, properties, density-moisture relationship, strength in different directions, defects,

influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, common preservation treatments, Plywood.

Bricks: Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength.

Cement: Compounds of, different types, setting times, strength.

Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry.

3. Concrete Technology:

Concrete: Importance of Water Cement Ratio, Selection of Sand and Stone, Strength, ingredients including admixtures, workability, testing for strength, elasticity

4. Construction

Masonry principles using Brick, stone, Blocks -- construction detailing and strength characteristics,

Types of plastering, pointing, flooring, roofing and construction features,

Common repairs in buildings, Principles of functional planning of building for residents and specific use, Building code provisions,

5. SURVEYING:

Classification of surveys, scales, accuracy; Common methods, Measurement of distances - direct and indirect methods; and instruments for distance and angle measurement for CE work - their use in plane table, traverse survey, leveling work, layout survey for building works, setting up of curves, optical and electronic devices; Measurement of directions, prismatic compass, local attraction; Theodolites (Digital and

non-digital) - types; Measurement of elevations - Spirit and trigonometric levelling; Relief representation; Contours; Digital elevation modelling concept;

6. HYDROLOGY:

Hydrological cycle, precipitation, evaporation and related data analyses, PMP, precipitation, Evaporation and transpiration, infiltration, overland flow, unit and synthetic hydrograph, Floods and their management, flood frequency analysis, Streams and their gauging.

7. STRUCTURAL ANALYSIS

Unsymmetrical bending: Moment of inertia, product of inertia, position of Neutral Axis and Principle axes, calculation of bending stresses and shear stress.

Analysis of determinate structures - different methods including graphical methods.

8. Design of R.C.C. Structure, steel structure, masonry structure

a. Design of Reinforced Cement Concrete and Masonry Structures:

Reinforced Concrete: Working Stress method of design – Recommendations of I.S. codes, Design of one way Slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity.

Cantilever type retaining walls.

Water tanks: Design requirements for Rectangular resting on ground.

b. DESIGN OF STEEL STRUCTURES

Structural Steel: Factors of safety and load factors. Principles of working stress method. Riveted, bolted and welded connections. Design of tension and compression members.

c. DESIGN OF MASONRY STRUCTURES

Design of brick masonry as per I.S. Codes. Design of stone masonry structures including retaining walls.

9. CONSTRUCTION EQUIPMENT, PLANNING AND MANAGEMENT

Concreting Equipment: Weight Batcher, Mixer, vibrator, batching plant, concrete pump.

Earthwork Equipment: Power shovel, hoe, dozer, dumper, trailers and tractor, rollers, sheep foot rollers, pumps.

10. Irrigation Engineering

- i. Water requirements of crops: consumptive use, duty and delta, irrigation methods and their efficiencies.
- ii. Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals.
- iii. Water logging: causes and control salinity.
- iv. Canal structures: Description of head regulators, canal falls, aqueducts, metering flumes and canal outlets.
- v. Diversion headwork: Description of weirs of permeable and impermeable foundation, energy dissipation.

- vi. Storage works: Types of dams.
- vii. Spillways: Spillway types, energy dissipation.

11. ENVIRONMENTAL ENGINEERING

(a) WATER SUPPLY ENGINEERING:

Sources of supply, yields, design of intakes and conductors; Estimation of demand; impurities of water and their significance, Water quality standards, Control of Water-borne diseases; Primary and secondary treatment; Water treatment principles of coagulation, flocculation and sedimentation; slow-, rapid-, pressure-, filters; chlorination, softening, removal of taste, odour and salinity.

Conveyance and distribution systems of treated water, leakages and control; Rural water supply; Institutional and industrial water supply.

(b) WASTE WATER ENGINEERING:

Urban rain water disposal; Systems of sewage collection and disposal; Description of sewers and sewerage systems; pumping; Characteristics of sewage and its treatment, Working principles, units, chambers. sedimentation tanks, trickling filters. oxidation ponds. activated sludge process, septic tank. disposal of sludge. recycling of wastewater.

Disposal of products of sewage treatment, Plumbing Systems; Rural and semi-urban sanitation.

(c) SOLID WASTE MANAGEMENT

Sources, classification, collection and disposal in rural and urban contexts;

(d) AIR AND NOISE POLLUTION AND ECOLOGY:

Sources and effects of air pollution, monitoring of air pollution; Noise pollution and standards.

12 GEOTECHNICAL ENGINEERING

Soil Type and structure - gradation and particle size distribution - consistency limits.

Properties of soils, classification and interrelationship; Compaction behavior, methods of compaction and their choice, Laboratory and field tests,

Earth pressure theory and analysis for retaining walls, Bearing capacity of soil - stability of slope of earth work.

13 FOUNDATION ENGINEERING:

Types of foundations, Selection criteria for foundation of structures, bearing capacity, settlement, Types of piles and their layout. Foundations on expansive soils, foundation on swelling soils.

14 TRANSPORTATION ENGINEERING

Principles of Highway alignment and classification and geometric design elements and standards for Roads, horizontal and vertical, -curves, grade separation; Materials and construction methods for different surfaces and maintenance. Pavement structure for flexible and rigid pavements - Standards of materials for stabilized soil, WBM, Base course, Sub-base course, bituminous works and rigid pavement, Drainage.

Typical construction methods, Surface and sub-surface drainage arrangements for roads - culvert structures. Types of bridges and their selection.

15 ESTIMATION AND COSTING

Basic principles of detailed and approximate estimating - specification writing and rate analysis principles of valuation of real property

Estimation of masonry wall, RCC structure, earthwork, pipeline, steel structure, road pavement and drainage. and preparation of cost estimate.

16 ENGINEERING DRAWINGS

Drawing of masonry wall. RCC structure, pipeline, water retaining structure, road pavement, Water Treatment Plant, Sewage disposal system, Sewage Treatment Plant, different type of Bridges, longitudinal drainage, cross drain and reinforcement details of all the related structures.

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B General Knowledge

1. Civil Engineering related
2. Current Affairs
 - Nation based affairs
 - State based affairs
3. History related
 - Nation based
 - State based