HINDUSTAN PETROLEUM CORPORATION LIMITED

Regd. Office: 17, Jamshedji Tata Road, Mumbai - 400020.
CIN NO: L23201MH1952GOI008858

SYLLABUS FOR COMPUTER BASED TEST
CIVIL ENGINEERING POSITIONS

1. Structural Engineering

Solid Mechanics: Bending moment and shear force in statically determinate beams; Simple stress relationships; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Construction Materials and Management: Construction Materials: Structural Steel - Composition, material properties and behaviour; Concrete - Constituents, mix design, short-term and long-term properties.

Construction Management: Types of construction projects; Project planning and network analysis - PERT and CPM; Cost estimation.

Concrete Structures: Working stress and Limit state design concepts; Design of beams, slabs, columns; Bond and development length; Prestressed concrete beams.

Steel Structures: Working stress and Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections - simple and eccentric, beam-column connections, plate girders and trusses; Concept of plastic analysis - beams and frames.

Repair and Rehabilitation of RCC and masonry structure- Types and causes of deterioration, Prevention measure, materials of repair, maintenance and repair strategies, strengthening of existing structures

RCC Retaining walls—Selection of type of wall; Design facets; Construction features; Reinforcement detailing.

Masonry Walls—Selection of type of wall; Design facets; Construction features.

2. Geotechnical Engineering

Soil Mechanics: Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Seepage through soils – two - dimensional

flow, flow nets, uplift pressure, piping, capillarity, seepage force; Principle of effective stress and quicksand condition; Compaction of soils; One- dimensional consolidation, time rate of consolidation; Shear Strength, Mohr's circle, effective and total shear strength parameters, Stress-Strain characteristics of clays and sand; Stress paths.

Foundation Engineering: Sub-surface investigations - Drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories - Rankine and Coulomb; Stability of slopes – Finite and infinite slopes, Bishop's method; Stress distribution in soils – Boussinesq's theory; Pressure bulbs, Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations - dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

Ground Improvement techniques- Different types and uses.

Seismic design Codes.

3. Water Resources Engineering

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum and energy equations and their applications; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth; Concept of lift and drag.

Hydraulics: Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.

Gravity Dams and Spillways; Lined and unlined canals, Design of weirs on permeable foundation; cross drainage structures.

4. Environmental Engineering

Water and Waste Water Quality and Treatment: Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water distribution system; Drinking water treatment.

Sewerage system design, quantity of domestic wastewater, primary and secondary treatment. Effluent discharge standards; Sludge disposal; Reuse of treated sewage for different applications.

Air Pollution: Types of pollutants, their sources and impacts, air pollution control, air quality standards, Air quality Index and limits.

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle energy recovery, treatment and disposal).

5. Transportation Engineering

Transportation Infrastructure: Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignments.

Highway Pavements: Highway materials - desirable properties and tests; Desirable properties of bituminous paving mixes; Design factors for flexible and rigid pavements; Design of flexible and rigid pavement using IRC codes.

6. Geomatics Engineering

Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves.

7. Building Architectural and Maintenance work

Structural and architectural use of wood and Plywood work, wood Surface finishing, Building interior and external painting, toughen glass work, Aluminium work, Internal & External Cladding work (Example- Glass cladding, Aluminium Composite panel etc.), false ceiling , false flooring, Plumbing work, various methods of terrace waterproofing, Roof cladding ,termite and pest control treatment. Alternate wood products and exteriors for building facades.

Building lighting & electrification and earthing-Basic principles & facets

Fire Protection for Buildings- Basic principles & facets

8. Prefabricated Structures

Civil structures (compound walls, repetitive foundations like in pipe support etc. and also steel structures)

9. Innovation Technology in Construction

Monolithic concrete construction using aluminum or composite formwork, Expended polystyrene core panel system, Light gauge sheet framed structure, Industrialized 3-S system using RCC precast with or without shear wall column beams, Speed floor system, Glass Fiber reinforced Gypsum panel building, Factory made fast track Modular system

Building Information Modelling-Applications. Familiarization with National Building Code of India 2016

NOTE: The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects and their qualifying degree.