Department of Civil Engineering, SoET
Baba Ghulam Shah Badshah University Rajouri (J & K)

Syllabus for Ph.D. Entrance Test in Civil Engineering (2025-26)

Note: *The Entrance Test shall be based on a single question paper comprising of two sections 'A' and 'B'. The section 'A' of the question paper will be according to the syllabus of concerned subject (Civil Engineering) and section 'B' will be from Research methodology. The question paper will consist of multiple choice (objective type) questions only; each of one mark. Each question will have 4 alternative responses marked as (A), (B), (C) and (D). Applicant is required to darken the circle as against the most appropriate response for each multiple-choice question.*

Section A: (Civil Engineering)

Engineering Mechanics & Solid Mechanics: System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Frictions and its applications; Centre of mass. Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Simple bending theory, flexural and shear stresses, shear centre.

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.

Concrete & Concrete Structures: Constituents of concrete, Mix design, short-term and long-term properties of concrete. 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.

Geotechnical Engineering: Three-phase system and phase relationships, index properties; Unified and Indian 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; Shear Strength, Mohr's circle, effective and total shear strength parameters; Stress-Strain characteristics of clays and sand; Stress paths.

Fluid Mechanics & Hydraulics: Properties of fluids, fluid statics; Continuity, momentum and energy equations; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe networks; Boundary layer concept; Lift and drag. Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Channel hydraulics - specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.

Environmental Engineering: Water quality standards; Water treatment; Sewerage system design; Wastewater treatment; Effluent discharge standards; Sludge disposal; Solid waste management.

Hydrology & Irrigation: Precipitation and its measurement; Evaporation; Evapotranspiration; Watershed; Infiltration; Unit hydrographs; Reservoir capacity; Flood estimation and routing; Groundwater hydrology; Application of Darcy's Law. Types of irrigation systems and methods; Crop water requirements - Duty, delta, evapotranspiration; Gravity dams and spillways; Lined and unlined canals; Design of weirs; Cross drainage structures.

Section B: (Research Methodology)

Introduction to Research: The concept of research, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Importance of Review of Literature, Organizing the Review of Literature.

Types of Research: Types of research, pure (basic, fundamental) and applied research, qualitative and quantitative.

Research Design: Meaning, need, types of research design – Exploratory, Descriptive, Casual research Design, Components of research design and Features of good Research design. Experiments, surveys and case study Research design.

Sampling, Data Collection and Analysis: Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods–sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: Applications of Statistics in Research, measures of central tendency and dispersion

Research Report: Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords. Thesis and dissertations. Components of thesis and dissertations. Referencing styles and bibliography.

Model Questions

Section A

Q1. The method of superposition can be applied to analyse beams and frames when:
A. the structure is statically determinate only
B. the material follows nonlinear stress-strain behaviour
C. the structure behaves elastically and obeys Hooke's law
D. large deflections occur

Q2. The property of fresh concrete where water in the mix tends to rise to the surface while placing and compacting is called:
A. Segregation
B. Bleeding
C. Bulking
D. Creep

Q3. Which of the following represents the continuity equation for a steady, incompressible fluid flow through a varying cross-sectional area:
A. $A_1V_1 + A_2V_2 = 0$
B. $A_1V_1 + A_2V_2 = \infty$
C. $A_1V_1 > A_2V_2$
D. $A_1V_1 = A_2V_2$

Q4. According to Darcy's Law, the velocity of flow through a saturated soil mass is directly proportional to:
A. The soil void ratio
B. The hydraulic gradient
C. The square of the hydraulic gradient
D. The cross-sectional area