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Civil Engineering Syllabus for Uttarakhand State Civil
Services Main Exam-2011

CIVIL ENGINEERING

PAPER-I

PART 'A'

(a) Theory of Structures : Principle of superposition; reciprocal theorem unsymmetrical bending, Determinate and indeterminate Structures; simple and space frames; degrees of freedom; virtual work; energy theorem; deflection of trusses; indeterminate beams & frames, three-moment equation; slope deflection and moment distribution methods; column analogy; Energy methods; approximate and numerical methods. Moving loads-Shearing force and Bending moment diagrams, influence lines for simple and continuous beams. Analysis of determinate and indeterminate arches. Matrix methods of analysis, stiffness and flexibility matrices.

(b) Steel Design : Factors of safety and load factor; Design of tension, compression and flexural members; built up beams and plate girders, semi-rigid connections. Design of Stanchions, Slab and gusseted bases; gantry girders; roof trusses; Industrial and multistoreyed buildings. Plastic design of frames and portals.

(c) R C Design : Working stress and limit State methods of design; Design of slabs, simple and continuous beams, rectangle T & L sections, columns, Footing-single and combined, raft foundations, Elevated water tanks, emcased beams and column, Methods and systems of prestressing, anchorages, losses in prestress.

PART 'B'

(a) Fluid Mechanics : Dynamics of fluid flow-Equations of continuity; energy and momentum. Bernoulli's theorem; cavitation. Velocity potential and stream function; rotational and irrotational flow; free and forced vortices; flow net. Dimensional analysis and its application to practical problems. Viscous flow-flow between static and moving parallel plates, flow through circular tubes. film lubrication. Velocity distribution in laminar and turbulent flow; critical velocity; losses, Stanton diagram. Hydraulic and energy grade lines, siphons, pipe network. Forces on pipe bends. Compressible flow. Adiabatic and isentropic flow, subsonic and supersonic velocity; Mach number, shock wave, Water Hammer.

(b) Hydraulic Engineering : Open channel flow- Uniform and non-uniform flow, best hydraulic cross-section. Specific energy and critical depth, gradually varied flow, classification of surface profiles; control section; standing wave flume; Surges and waves; Hydraulic jump.

Design of canals : Unlined channels in alluvium; the critical tractive stress principles of sediment transport, regime theories, lined channels; hydraulic design and cost analysis; drainage behind lining.

Canal Structure- Designs of regulation work; cross drainage falls, aqueducts metering flumes, etc. Canal outlets.

Diver Headworks- Principles of design of different parts on impermeable and permeable foundations; Khosla's theory; Energy dissipation, sediment exclusion.

Dams- Design of rigid dams, earth dams; Forces acting on dams; stability analysis
Spillways- different types and their suitability. Design of spillways.

(c) Wells and Tube wells- Soil Mechanics and Foundation Engineering-Soil Mechanics-Origin and classification of soils; Atterburg limits, void ratio; moisture contents; permeability; laboratory and field tests. Seepage and flow nets, flow under hydraulic structures, uplift and quick sand condition. Unconfined and direct shear tests; triaxial test; earth pressure theories, stability of slopes; Theories of soil consolidation; rate of settlement. Total and effective stress analysis, pressure distribution in soils; Boussinesque and Westergaard theories. Soil stabilization. Foundation Engineering, Bearing capacity of Footings; piles and wells; design of retaining walls; Sheet Piles and caissons. Machine foundations.

PAPER-II
PART 'A'

(a) Building Construction- Building Materials and Construction-timber, stone, brick, cement, steel sand, mortar, concrete, paints and varnishes plastics, water proofing and damp proofing materials.

Detailing of walls, floors, roofs, staircases, doors and windows. Finishing of building plastering, pointing, painting etc. Use of building codes. Ventilation, air conditioning, lighting and acoustics. Fire proofing and Earthquake resistant of buildings. Building estimates and specifications. Construction scheduling PERT AND CPM methods, Base chart.

(b) Railways and Highways Engineering- Railways-Permanent way ballast, sleeper; chairs and fastenings; points and crossing different types of turn outs, cross-over setting out of points.

Maintenance of track super elevation; creep of rails; ruling gradients; track resistance tractive effort; curve resistance Station yards and machines, station buildings; platform sidings; turn tables. Signals and interlocking; level crossings.

Roads and Runways- Classification of roads, planning geometric design. Design of flexible and rigid pavements; sub-bases and wearing surfaces. Traffic engineering and traffic survey; intersections road signs; signals and markings.

(c) Surveying- Plane Table Surveying-Equipment & methods, Solution of 3 & 2 point problems. Error and precautions. Triangulation; Grades Baseline and its measurement, Satellite station, Intervisibility of Stations; Great Trigonometrical Survey of India. Error and least squares method general methods least squares methods with interdisciplinary approach. Adjustment of level nets and triangulation nets. Matrix notation solutions. Layout of curves: Simple, compound, reverse, transition and vertical curves. Project surveys and layout of civil Engineering works such as buildings, bridges, tunnels and hydroelectric projects. Introduction to photogrammetry and Remote sensing.

PART 'B'

(a) Water Resources Engineering- Hydrologic cycle; precipitation; evaporation-transpiration and infiltration hydrographs; units hydrograph; Flood estimation and frequency. Planning for water Resources. Ground and Surface water resources; surface flows. Single and multipurpose projects storage capacity, reservoir losses, reservoir silting flood routing. Benefit cost ratio. General principles of optimization. Elements of water Resources management.

Water Requirements for crops- Quality of irrigation water, consumptive use of water, water depth and frequency of irrigation; duty of water; Irrigation methods and efficiencies.

Distribution system for canal irrigation- Determination of required channel capacity channel losses. Alignment of main and distributary channels. Waterlogging- Its causes and control, design of drainage system; soil salinity-River Training-Principles and Methods. Storage Works- Types of dams (including earth dams), and their characteristics principles of design, criteria for stability. Foundation treatment; Joints and galleries, Control of seepage.

(b) Sanitation and Water Supply- Sanitation-Site and orientation of buildings ventilation and damp proof course house drainage; conservancy and waterborne system of waste disposal sanitary appliances, latrines and urinals.

(c) Environmental Engineering- Elementary principles of Ecology and Ecosystems and their interaction with environment. Engineering activity and Environmental pollution, environment and its effects on human health and activity. Air Environment: Major pollutants and their adverse effects, types of air cleaning devices. Water quality: Parameters, adverse effects, monitoring salt purification of streams. Solid wastes: collection system and disposal methods, their selection and operation. Typical features of water distribution of Water distribution system: Demand, Available need, network analysis, storage, corrosion.

Typical features of Sewerage systems: Permissible velocities, partial flow in circular sewers, non-circular sections, corrosion in sewers, construction and maintenance, sewer appurtenances, Pumping of sewage. Plumbing: Standards & Systems. Environmental Management.