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CPB

Syllabus of /CBT (Computer Based Test) scheduled at IIT, Roorkee (Uttarakhand)
scheduled on 02/7/2017.

I) Technical Part/ Section "A"

Water and Wastewater Engineering

Water and wastewater quality parameters- physical, chemical, bacteriological; sourcing of water-surface and groundwater, types of intakes and wells; water treatment- settling, coagulation flocculation, sedimentation, filtration, hardness removal, disinfection, etc.; water supply engineering- population and forecasting of water demands, reservoirs, networks, its components, etc.; Wastewater collection and conveyance including storm water, sewerage and related components, wastewater treatment - screen, grit chamber, sedimentation, biological treatment process- suspended growth process such as activated sludge process, attached growth process including trickling filter, pond-based treatment process, sludge digestion and dewatering processes, low-cost and onsite sanitation processes.

Surveying

Basic principles and Importance of surveying to engineering projects. Type of maps, scales and uses, plotting accuracy, map sheet numbering, coordinate and map projection. Surveying equipment, levels, compass, theodolites, tachometer, EDM, total Stations and other instruments. Measurement of angles, directions and distances. Determination of elevation, spirit leveling, trigonometrical leveling, and tachometric surveying, contouring. Plane table surveys and mapping. Methods of control establishment, traversing, triangulation, adjustment of survey measurements, computation of coordinates.

Geotech

Physical properties of soils: three phase relationships, GSD, Classification; Compaction: clay mineral, compaction tests, field compaction; Capillarity, permeability and seepage: Determination of permeability (laboratory and field tests), permeability in stratified soils, flow nets, confined and unconfined flows, piping; Compressibility and consolidation: concepts related to 1-D consolidation, coefficient of consolidation, 3-D consolidation, vertical sand drains; Shear strength of soils: Principle of effective stress, Mohr-Coulomb failure criterion, direct shear test, unconfined compression test, Triaxial shear test : consolidated drained, consolidated undrained, unconsolidated undrained, vane shear test, shear strength of clays and sands, critical void ratio, stress path, pore-pressure coefficient; Soil exploration; Earth pressure and retaining walls (Rankine and Coulomb's earth pressure theories); Shallow foundations: bearing capacity and settlement, Stresses below foundations; Sheet piling and bracing of foundation excavation; Pile foundations: load carrying capacity of individual and group of piles, settlement; Well foundations: methods of construction, tilt and shift, bearing capacity and settlement, lateral stability of well foundation; Stability analysis of slopes: infinite slopes, method of slices and Bishop's simplified method.

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Transportation

Road and Highway Planning in India; Alignment fixing and surveys; Geometric design of roads and highways - factors affecting, cross-sectional elements, sight distances, horizontal alignment design, vertical alignment design, pedestrian and bicycle facility; Access control; Traffic Engineering - Traffic flow characteristics and their relationships, traffic volume studies, speed studies, delay and travel time studies, parking studies and accident studies and analysis; Traffic control devices - Signs, Markings, Signals, specifications and design process, channelization, types of intersections, types of maneuvers; Capacity of roads - urban roads and rural highways; Road Materials - Soil, Aggregates and bitumen, tests and specifications; Pavements - Flexible and rigid pavements, design factors and concept, IRC design procedure for flexible and rigid pavements

Structures

Strength of Material: Analysis of stress and strains, Axially loaded members, Mechanical properties, Stress transformation, Members subjected to torsional loads, Members subjected to flexural loads, Bending moment and shear force in beams, Bending stress and shear stresses in beams, Deflection in beams, Moment area method, Buckling of column, Unsymmetrical bending and shear center

Design of Concrete elements: Concrete technology, Concepts of working stress and limit state design, Design of beams in flexure, Design for torsion, Design of slabs, Design of compression members, Design of footing, prestressed concrete

Structural Analysis: Degree of indeterminacy, Analysis of statically determinate and indeterminate members, Analysis of three and two hinged arch, Moment distribution method, Slope deflection method, Theorem of three moments, Flexibility method, Matrix displacement method, Moving load analysis, Castigliano's theorem, Conjugate beam method, Unit load method, Plastic analysis,

Design of steel elements: Concepts of limit state design, Bolted connection (ordinary and High strength friction grip), Bracket connection, Design of tension member, Design of compression member, Built of column, Colum base, Design of beams (Laterally supported and unsupported), Design of purlin, Gantry girder, Plate girder

Building materials and construction: Bricks, Cement, Mortar, Steel

Hydraulics

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

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Hydraulics: Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Kinematics of flow, velocity triangles; Basics of hydraulic machines, specific speed of pumps and turbines; Channel Hydraulics - Energy-depth relationships, specific energy, critical flow, slope profile, hydraulic jump, uniform flow and gradually varied flow

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, flood estimation and routing, reservoir capacity, reservoir and channel routing, surface run-off models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's law.

Irrigation & Hydraulic structures: Duty, delta, estimation of evapo-transpiration; Crop water requirements; Design of lined and unlined canals, head works, Design of weirs/barrage on permeable foundation; Types of irrigation systems, irrigation methods; Water logging and drainage; Canal regulatory works, cross-drainage structures, outlets and escapes, gravity and embankment dams, spillways.

Section "B" - General Awareness and Numerical Ability

Numerical ability, mathematical ability, reasoning, mental ability, general studies and general awareness
