DEPARTMENT OF CIVIL ENGINEERING

Syllabus for Written Test for Admission to PhD (Full Time) Programme in Civil Engineering – July 2017

Structural Mechanics:

Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Uniform torsion, buckling of columns, combined and direct bending stresses.

Structural Analysis:

Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/energy methods, analysis by displacement methods (slope deflection and moment distribution methods), influence lines for determinate and indeterminate structures.

Concrete Technology and Design of Concrete Structures:

Concrete Technology- properties of fresh and hardened concrete, basics of mix design, non-destructive testing of concrete. Special concretes such as self compacting concrete, fibre reinforced concrete, high strength/performance concrete, Concrete design- basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods. Basic elements of prestressed concrete, analysis of beam sections at transfer and service loads.

Steel Structures:

Analysis and design of tension and compression members, beams and beam- columns, column bases. Connections- simple and eccentric, beam column connections, plate girders and trusses. Plastic analysis of beams and frames.

Soil Mechanics:

Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships, permeability & seepage, effective stress principle, consolidation, compaction, shear strength.

Foundation Engineering:

Sub-surface investigations- penetration tests, plate load tests. Earth pressure theories, effect of water table, layered soils. Stability of slopes-infinite slopes, finite slopes. Foundation types-foundation design requirements. Shallow foundations-bearing capacity, effect of water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations- pile types, dynamic & static formulae, load capacity of piles in sands & clays, negative skin friction, well foundations.Ground improvement.

Highway Engineering:

Basic concepts of Highway Geometric Design, Highway materials and construction, Design of flexible and rigid Pavements.

Building Materials:

Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminum, Fly Ash Admixtures, Timber, Bricks and Aggregates: Classification, properties and selection criteria;Cement: Types, Composition, Properties, Uses, Specification and various Tests; Lime & Cement Mortars and Concrete:Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

Building Construction:

Introduction to Brick Masonry, Stone Masonry, Walls, Damp Proofing, Arches and Lintels, Doors and Windows, Stairs and Staircases, Plastering and Pointing, White washing, distempering and painting, Scaffolding.

Environmental Engineering:

Sources, Estimation, quality standards and testing of water and treatment; Rural, Institutional and industrial water supply; Physical, chemical and biological characteristics and sources of water, Pollutants in water and its effects, Estimation of water demand; Drinking water Standards, Water Treatment Plants, Water distribution networks.

Planning & design of domestic waste water, sewage collection and disposal; Plumbing System. Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; Industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management.

Air, Noise pollution and Ecology.

Fluid Mechanics:

Fluid properties; Dimensional Analysis and Modeling; Fluid dynamics including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; Pipe networks.

Various pumps, Air vessels, Hydraulic turbines – types, classifications & performance parameters; Power house – classification and layout, storage, pondage, control of supply.

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