



## SYLLABUS FOR PhD ENTRANCE EXAMINATION -2023

### SCHOOL OF CIVIL ENGINEERING

Marks 50

#### Unit-1 Structural Engineering

Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress–Strain Diagram for structural steel and non ferrous materials, Principle of superposition, Total elongation of tapering bars of circular and rectangular cross sections, volumetric strain, expression for volumetric strain, Elastic constants, Relationships among elastic constants, Stresses in composite bars, Thermal stresses in simple and compound bars- Types of beams, loadings and supports, Shearing force, Bending moment.

Concrete Technology, Indian Standard Code Provisions.

#### Unit-2 Fluid mechanics

Definition of Fluid, Systems of units, properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension, & capillarity. Newton's law of viscosity. Capillary rise in a vertical tube and between two plane surfaces

Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Vapour pressure. Measurement of pressure using simple, differential & inclined manometers. Introduction to Mechanical and electronic pressure measuring devices.

#### Unit-3 Environmental Engineering

Systems of water supply, Objectives of water quality management, Water quality parameters – Physical, chemical and Microbiological, Sampling, Water quality analysis (IS: 3025 and IS: 1622), Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc and toxic / trace organics, water borne diseases, Objectives of Water Treatment, Flow chart of treatment units, Aeration- Principles, types; Sedimentation- theory, types

#### Unit-4 Geotechnical Engineering

Formation of soil – types of soil – clay mineralogy and soil structure: Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Common clay minerals in soil and their structures- Index Properties-Three phase system of soil and their relationships –Grain size analysis – Stoke's law and

hydrometer analysis – Consistency of soils –Determination of consistency indices  
– Classification of coarse grained and fine grained soil as per BIS

### **Unit-5 Transportation Engineering**

Importance of transportation, comparison of various modes of transportation, importance and scope of highway engineering, highway planning and alignment, importance of highway geometric design and scope of traffic engineering, principles of urban transportation, mass transit facilities, integration of different modes of transportation

### **Unit-6 Construction Technology and Management**

Introduction: Construction Projects- Concept, Project Categories, Characteristic of projects, project life cycle phase. Project Management- Project Management Function, Role of Project Manager. Organizing For Construction - Principles of organization, type of organization structure. Project planning Scope: Planning Process, Objectives, Types of Project plans, Resource Planning Process. Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT A-O-N Network-Logic and Precedence diagrams, advantages, Drawing A-O-N network from A-O-A network and related problems. Time Cost relationship: Direct and indirect cost, step in optimization of cost, related problem. Allocation of resources: Histogram, Resource smoothing, Resource leveling and related problem. Project updating using CPM network and related numerical problems.

## **PART – B RESEARCH METHODOLOGY**

**Research and Types of research:** Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research.

**Research Formulation** – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs- patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

**Data Collection** and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and-Interpretation.

**Interpretation and report writing** - Techniques of interpretation - Structure and components of scientific reports - Different steps in the preparation - Layout, structure and language of the report - Illustrations and tables - Types of report - Technical reports and thesis

**Reference Books:**

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. *An introduction to Research Methodology*, RBSA Publishers.
2. Kothari, C.R., 1990. *Research Methodology: Methods and Techniques*. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. *Research Methodology*, Ess Ess Publications. 2 volumes.
4. Anderson, T. W., *An Introduction to Multivariate Statistical Analysis*, Wiley Eastern Pvt., Ltd., New Delhi
5. Sinha, S.C. and Dhiman, A.K., 2002. *Research Methodology*, Ess Ess Publications. 2 volumes.
6. Trochim, W.M.K., 2005. *Research Methods: the concise knowledge base*, Atomic Dog Publishing. 270p.
7. Fink, A., 2009. *Conducting Research Literature Reviews: From the Internet to Paper*. Sage Publications

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