ELECTIVE-IV (BCE409)

1. Prestressed Concrete (3-1-0): Credits-04

(Relevant IS Codes are permitted in the examination)

Different systems of prestressing, Characteristics of concrete and steel, Other suitable materials, Losses in prestress.

Analysis and design of section for flexure, shear and torsion. Design of flexural member. Limit state design as per IS code.

Deflection of prestressed structures- short term as well as long term deflections of uncracked and cracked members.

Stress distribution in end-block of post tensioned section. Magnel's method, Guyen's method, Rowe's method and IS code method.

Indeterminate structures- Principles of design of prismatic continuous beams of two equal, unequal spans with same and variable moments of inertia, Cap cable, Design concept of concordancy of cable, Secondary design consideration.

Design of Pre-tensioned and Post-tensioned beam

Reference Books:

1. E. W. Bennet- "Prestressed concrete theory & design"- Chapman & Hall, London-1962.
2. T. Y. Lin & H. Burns Ned,- "Design of prestressed concrete structures", Johnwilley & Sons, New York-1982.
3. N. Krishnaraju- "Prestressed concrete"- Tata McGraw-Hill, New Delhi-2004.
4. S. K. Mallik & A. P. Gupta- "Prestressed concrete"- Oxford & IBH, New Delhi-1982

2. Composite Materials and Structures (3-1-0) Credits:04

Classification and characteristics of Composite materials, advantages and limitations,

Basic Concepts and characteristics: Homogeneity and Heterogeneity, Isotopy, Orthotopy and Anisotropy; Characteristics and configurations of lamina, laminate, micromechanics and macromechanics. Constituent materials and properties.

Elastic behaviour of unidirectional lamina, Strength of unidirectional lamina, Macromechanical failure theories : Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill),Interactive tensor polynomial theory (Tsai-Wu)

Elastic Behaviour of multidirectional laminates: Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties, Bending of laminated plates: Governing equations, Deflection of simply supported rectangular symmetric angle-ply, specially orthotropic, anti-symmetric cross-ply laminates.

Reference Books:

1. Robert M. Jones, “Mechanics of Composite materials”, McGraw-Hill Book Company
2. I M Daniel and O. Ishai, “Engineering mechanics of Composite materials”, Oxford university press
3. P.K. Mallick , “Fiber-reinforced Composites”, Marcel Dekker inc
4. D. Hull and T W Clyne, “An introduction to composite materials”, Cambridge university press
5. J N Reddy, Mechanics of laminated composite plates and shells: theory and analysis, CRC Press

3. Pavement Design (3-1-0) Credit: 04

Module –I

1.Classification of pavements : Difference between Highway and Airport pavements, Geometric and structural design requirements of pavements. Factors affecting pavement – design principles and criteria for design of flexible pavements.

2.Wheel loads on Pavements : Different configurations, contact area, equivalent single wheel load (ESWL) and equivalent wheel load (EWL)

Module - II

Design methods for flexible pavements : Main aspects of group index, North Dakota. Kansas, U.S.Navy/C.B.R. and Wyoming Highway methods, Design of flexible pavements and IRC, CBR design curves, Burmister's layer theory and its application in flexible pavement design.

Module – III

Rigid Pavements : Critical loading regions, Formulas for corner stresses by Older, Picket and others- Westergard's theory for stresses in concrete pavements for corner, Edge and interior loadings.

Module – IV

Temperature stresses in rigid pavements, Westergard, Bradbury and concepts.

IRC for guide lines for design of rigid pavements.

Joints in rigid pavements, Their design requirements.

Pavement over lays – flexible and rigid types.

General principles of design – IRC recommendations.

Books for reference :

1. Pavement design – By – E.J. Yoder and Warwich
2. Highway Engineering – By – S.K.Khanna and C.E.G. Justo
3. I.R.C. Codes

4. GROUND IMPROVEMENT TECHNIQUES (3-1-0): CREDIT-04

Module – I

Introduction, Necessity of ground improvement, Dewatering, methods, Analysis and design of dewatering systems.

Grouting types, Properties, Method of grouting, Ground selection and control.

Module – II

Compaction, Methods of compaction, Engineering prosperities of compacted soil, Field compaction and its control.

Module – III

Soil stabilization, Use of chemical additives, Stone columns, Principle, design and method of installation.

Module – IV

Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells in construction work.

Textbooks :

1. Foundation Design and Construction, M.J. Tomlinson
2. Foundation Engineering, G.A. Leonard, Tata McGraw Hill
3. Modern Geotechnical Engineering, Alam Singh, IBT Publishers

5. Soil Dynamics and Earthquake Engineering (3-1-0): Credit-04

Introduction: Dynamic loading and dynamics of vibrations, Earthquake records, Earthquake records of India

Seismology: Plate tectonics, Causes of Earthquake, seismic waves, faults, earthquakes magnitude and intensity, seismographs.

Seismic hazards in India: Earthquake hazards in India, Earthquake records in north-eastern region, Earthquake hazard zoning, risk evaluation and mitigation, awareness campaign.

Dynamic soil properties: Introduction, soil properties for dynamic loading, measuring dynamic soil properties.

Seismicity: site seismicity, seismic soil response and design earthquake.

Liquefaction: introduction, factors affecting liquefaction, liquefaction analysis, anti-liquefaction measures.

Earthquake resistant design of shallow and deep foundations.

Analysis of retaining walls and slope stability for earthquakes.

REFERENCE BOOKS

Fundamentals of Soil Dynamics & Earthquake Engineering by B.B. Prasad, PHI Learning Pvt. Ltd

Basic Geotechnical Earthquake Engineering: Kamalesh Kumar, New Age International Publishing

Geotechnical Earthquake Engineering: S. L. Kramer, Prentice Hall International Publishing

Geotechnical Earthquake Engineering Hand Book: R. W. Day, © 2002 McGraw-Hill

6. WATER RESOURCES PLANNING AND MANAGEMENT (3-1-0) CREDIT: 04

Module I

Introduction, Role of water in national development, assessment of water resources of country, scope of water resources development in context of environment

Module II

Water resources planning process, planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives, cost-benefit analysis. Introduction to optimization techniques and systems approach.

Module III

Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-basin transfer of water.

Module IV

Conjuctive use of surface and groundwater, water quantity and quality modeling, evaluation of impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

TEXT BOOKS:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd.

2. Water Resources Economics - James & Lee. Oxford Publishers.

REFERENCES:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing House.