SCHEME OF TEACHING AND EXAMINATION

B.E. CIVIL EINGINEERING

V SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	06 AL 51	Management & Entrepreneurship	Any Dept.	04	-	03	25	100	125
2	06 CV 52	Design of structures RCC	Civil	04	--	03	25	100	125
3	06 CV 53	Structural Analysis – II	Civil	04	--	03	25	100	125
4	06 CV 54	Geotechnical Engineering. – I	Civil	04	--	03	25	100	125
5	06 CV 55	Hydrology and Water Resources Engineering	Civil	04	--	03	25	100	125
6	06 CV 56	Transportation Engineering – I	Civil	04	--	03	25	100	125
7	06 CVL 57	Hydraulics and Hydraulic Machinery Lab.	Civil	--	03	03	25	50	75
8	06 CVL 58	Computer Aided Design Lab.	Civil	--	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION

B.E. CIVIL EINGINEERING

VI SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	06 CV 61	Environmental Engineering - I	Civil	04	--	03	25	100	125
2	06 CV 62	Design & Drawing of RC structures	Civil	02	03	04	25	100	125
3	06 CV 63	Transportation Engineering – II	Civil	04	--	03	25	100	125
4	06 CV 64	Geotechnical Engineering. – II	Civil	04	--	03	25	100	125
5	06 CV 65	Irrigation Engineering. & Hydraulic Structures	Civil	04	--	03	25	100	125
6	06 CV 66x	**Elective-I (Group A)**	Civil	04	--	03	25	100	125
7	06 CVL 67	Geotechnical Engineering. Lab.	Civil	--	03	03	25	50	75
8	06 CVL 68	Extensive Survey Viva Voce	Civil	--	03	03	25	50	75
TOTAL				**24**	**09**	**25**	**200**	**700**	**900**

Elective-I (Group A)

06 CV 661	Matrix Method of Structural Analysis	06 CV 665	Ground Water Hydrology
06 CV 662	Alternative Building Materials and Technologies	06 CV 666	Rural Water Supply and Sanitation
06 CV 663	Ground Improvement Techniques	06 CV 667	Traffic Engineering
06 CV 664	Advanced Surveying		

SCHEME OF TEACHING AND EXAMINATION

B.E. CIVIL EINGINEERING

VII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	06 CV 71	Environmental Engineering.-II	Civil	04	--	03	25	100	125
2	06 CV 72	Design of Steel Structures	Civil	04	--	03	25	100	125
3	06 CV 73	Quantity Surveying and Estimation	Civil	04	--	03	25	100	125
4	06 CV 74	Design of Pre Stressed Concrete Structures	Civil	04	--	03	25	100	125
5	06 CV 75x	**Elective-II (Group B)**	Civil	04	--	03	25	100	125
6	06 CV 76x	**Elective-III (Group C)**	Civil	04	--	03	25	100	125
7	06 CVL 77	Environmental Engineering. Lab	Civil	--	03	03	25	50	75
8	06 CVL 78	Concrete & Highway Materials lab.	Civil	--	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Elective-II (Group B)

06 CV 751	Theory of Elasticity
06 CV 752	Advanced Design of RC Structures
06 CV 753	Structural Dynamics
06 CV 754	Earth and Earth Retaining Structures
06 CV 755	Highway Geometric Design
06 CV 756	Open Channel Hydraulics
06 CV 757	Solid Waste Management

Elective-III (Group C)

06 CV 761	Numerical methods in Civil Engineering
06 CV 762	Rock Mechanics
06 CV 763	Pavement Materials and Construction
06 CV 764	Photogrammetry and Remote Sensing
06 CV 765	Air Pollution and Control
06 CV 766	Design and Drawing of Bridges.: * (2 Hrs of Theory + 3 Hrs of Drawing) * (Exam Duration : 4 Hrs)
06 CV 767	Design of Masonry Structures

SCHEME OF TEACHING AND EXAMINATION

B.E. CIVIL EINGINEERING

VIII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	06 CV 81	Advanced Concrete Technology	Civil	04	--	03	25	100	125
2	06 CV 82	Design and Drawing of Steel Structures	Civil	02	03	04	25	100	125
3	06 CV 83x	**Elective-IV (Group D)**	Civil	04	--	03	25	100	125
4	06 CV 84x	**Elective-V (Group E)**	Civil	04	--	03	25	100	125
5	06 CV 85	Project Work	Civil	--	06	03	100	100	200
6	06 CV 86	Seminar	Civil	--	03	03	50	--	50
TOTAL				**14**	**12**	**19**	**250**	**500**	**750**

Elective-IV (Group D)

06 CV 831	Advanced Pre-stressed Concrete Structures
06 CV 832	Advanced Foundation Design
06 CV 833	Pavement Design
06 CV 834	Earthquake Resistant Design of Structures
06 CV 835	Industrial Waste Water Treatment
06 CV 836	Quality Management System in Civil Engineering.

Elective-V (Group E)

06 CV 841	Finite Element Analysis
06 CV 842	Reinforced Earth Structures
06 CV 843	Urban Transport Planning
06 CV 844	Geographic Information System
06 CV 845	Advanced Design of Steel Structures
06 CV 846	Design of Hydraulic Structures
06 CV 847	Environmental Impact Assessment

V SEMESTER

MANAGEMENT & ENTREPRENEURSHIP

Subject Code	**: 06AL51**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management – Management as a science, art or profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

ORGANIZING AND STAFFING: Nature and purpose of organization – principles of organization – Types of organization – Departmentation – Committees – Centralisation Vs Decentralisation of authority and responsibility – Span of control – MBO and MBE (Meaning only) Nature and importance of Staffing – Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – Coordination, meaning and importance and Techniques of Co-ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).

7 Hours

PART - B

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur, Evolution of Concept, Functions of Entrepreneur, Types of Entrepreneur, Entrepreneur – An emerging class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship, Stages in entrepreneurial process, Role of Entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

7 Hours

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives, Scope, role of SSI in Economic Development. Advantages of SSI. Steps to start an SSI – Government policy towards SSI, Different Policies of SSI., Government Support on SSI., during 5 year plans. Impact of Liberalization, Privatisation, Globalization on SSI. Effect of WTO / GATT Supporting Agencies of Government for SSI Meaning. Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only).

7 Hours

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes, TECKSOK, KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI, NSIC, SIDBI, KSFC.

6 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project, Project Identification, Project Selection, Project Report, Need and significance of Project, Contents, formulation, Guidelines by Planning Commission for Project Report, Network Analysis, Errors of Project Report, Project Appraisal. Identification of Business Opportunities. Market Feasibility Study: Technical Feasibility Study, Financial Feasibility Study & Social Feasibility Study.

6 Hours

TEXT BOOKS:

1. **Principles of Management** – P.C. Tripathi, P.N. Reddy, Tata McGraw Hill.
2. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House
3. **Entrepreneurship Development** – Small Business Enterprises – Poornima M. Charantimath – Pearson Education – 2006.

REFERENCE BOOKS:

1. **Management Fundamentals** – Concepts, Application, Skill Development – Robert Lusier – Thomson.
2. **Entrepreneurship Development** – SS Khanka – S Chand & Co.
3. **Management** – Stephen Robbins – Pearson Education / PHI – 17th Edition, 2003.
4. **Management & Entrepreneurship** by N V R Naidu & T Krishna Rao – I K International Publishing House Pvt. Ltd. 1st edition

DESIGN OF STRUCTURES – R.C.C

Subject Code	**: 06CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOTTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases.

6 Hours

REFERENCE BOOKS:

1. **Design of Reinforced concrete structures** - N. Krishnaraju, - (IS: 456 – 2000) 3rd edition CBS publishers, New Delhi.
2. **Limit State method of design** - A.K. Jain, Nemichand and Bros., Roorkee
3. **Reinforced Concrete-** Park & Paulay – John Wiley & Bros.
4. **Limit State design of Reinforced concrete**- B.C. Punmia, Ashok kumar Jain & Arun kumar Jain – Laxmi Publication, New Delhi.
5. SP-16 - Only Design charts pertaining to column design.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.

STRUCTURAL ANALYSIS – II

Subject Code	**: 06CV53**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ROLLING LOAD AND INFLUENCE LINES: Rolling load analysis for simply supported beams for several point loads and UDL.

Influence line diagram for reaction, SF and BM at a given section for the cases mentioned in above uinit 1

6 Hours

UNIT - 2

SLOPE DEFLECTION METHOD: Introduction, Sign convention, Development of slope-deflection equations and Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)

8 Hours

UNIT - 3

MOMENT DISTRIBUTION METHOD: Introduction, Definition of terms-Distribution factor, Carry over factor, Development of method and Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)

8 Hours

UNIT - 4

SWAY ANALYSIS: Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy $\leq$ 3) by slope deflection and moment distribution methods.

4 Hours

PART - B

UNIT - 5

KANIS METHODS: Introduction, Basic Concept, Analysis of Continuous beams and Analysis of rigid jointed non-sway plane frames.

6 Hours

UNIT - 6

FLEXIBILITY MATRIX METHOD OF ANALYSIS: Introduction, Development of flexibility matrix for plane truss element and axially rigid

plane framed structural elements and Analysis of plane truss and axially rigid plane frames by flexibility method with static indeterminacy ≤3.

7 Hours

UNIT - 7

STIFFNESS MATRIX METHOD OF ANALYSIS: Introduction, Development of stiffness matrix for plane truss element and axially rigid plane framed structural elements. And Analysis of plane truss and axially rigid plane frames by stiffness method with kinematic indeterminacy ≤3.

7 Hours

UNIT - 8

BASIC PRINCIPLES OF DYNAMICS: Basic principles of Vibrations and causes, periodic and aperiodic motion, harmonic and non-harmonic motion. Period and frequency.

Forced and Free Vibration, Damping and Equations of Single Degree of Freedom System with and without damping

6 Hours

TEXT BOOKS:

1. **Basic Structural Analysis**- Reddy C.S. - Second Edition, Tata McGraw Hill Publication Company Ltd.
2. **Theory of Structures Vol. 2** - S.P. Gupta, G.S. Pandit and R. Gupta, Tata McGraw Hill Publication Company Ltd.
3. **Dynamics of Structures**- Clough R.W. and Penzin J., Tata McGraw Hill Publications.
4. **Structural Analysis-II** -S. S. Bhavikatti – Vikas Publishers, New Delhi.

REFERENCE BOOKS:

1. **Indeterminate Structural Analysis**- J. Sterling Kinney, Oxford and IBH Publishing Co.
2. **Elementary Structural Analysis**- Noris C.H., Wilbur J.B.,, Mc Graw Hill International Book Edition.
3. **Advanced Structural Analysis**- Ashok K. Jain,, Nem Chand & Bros., Roorkee, India.
4. **Structural Analysis**- D.S. Prakash Rao,, A Unified Approach, University Press.
5. **Intermediate Structural Analysis**- C.K. Wang,, Mc Graw Hill Publications.

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 06CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOILS AND THEIR DETERMINATION: Index Properties of soils- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, insitu density, Activity of Clay, Laboratory methods of determination of index properties of soils: Moisture content, Specific gravity, Particle size distribution (Seive analysis and Hydrometer analysis only), Liquid Limit- Casagrande and cone penetration methods, Plastic limit and shrinkage limit determination.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, basis for soil classification, Particle size classification – MIT classification and IS classification, Textural classification. Unified soil classification and IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MIERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphus substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena**.**

7 Hours

PART - B

UNIT - 5

COMPACTION OF SOILS: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control, Proctor needle. Compacting equipments, Dynamic compaction, vibroflotation.

6 Hours

UNIT - 6

CONSOLIDATION OF SOILS: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v), Time rate of consolidation.

6 Hours

UNIT - 7

SHEAR STRENGTH OF SOILS: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, conventional and modified failure envelops, Total and effective shear strength parameters, Concept of pore pressure, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

6 Hours

UNIT- 8

DETERMINATION OF CONSOLIDATION AND SHEAR PROPERTIES OF SOIL: Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index, and coefficient of consolidation, determination of coefficient of consolidation by square root of time fitting method, logarithmic time fitting method and rectangular hyperbola method. Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

6 Hours

TEXT BOOKS:

1. **Principles of Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), " Van Nostrand Reinhold Co. Ltd.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.

HYDROLOGY AND WATER RESOURCES ENGINEERING

Subject Code	**: 06CV55**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition of hydrology. Importance of hydrology. Global water availability. India's water availability. Practical applications of hydrology. Hydrologic cycle (Horton's qualitative and engineering representations)

2 Hours

PRECIPITATION: Definition. Forms and types of precipitation. Measurement of rain fall using Symon's and Syphon type of rain gauges. Optimum number of rain gauge stations. Consistency of rainfall data (double mass curve method). Computation of mean rainfall (arithmetic average, Thiessen's polygon and Isohyetal methods). Estimation of missing rainfall data (Arithmetic average, normal ratio and regression methods). Presentation of precipitation data (moving average curve, mass curve, rainfall hyetographs, intensity – duration - frequency curves).

7 Hours

UNIT - 2

LOSSES FROM PRECIPITATION: Introduction. Evaporation: Definition, Process, factors affecting, measurement using IS Class A Pan. Estimation using empirical formulae. Infiltration: Definition, factors affecting infiltration capacity, measurement (double ring infiltrometer). Harton's infiltration equation, infiltration indices.

7 Hours

UNIT - 3

RUNOFF: Definition. Concept of catchment. Water budget equation. Components. Factors affecting. Rainfall - runoff relationship using simple regression analysis.

3 Hours

HYDROGRAPHS: Definition. Components of Hydrograph. Unit hydrograph and its derivation from simple storm hydrogaphs. Base flow separation. S – curve and its uses.

4 Hours

UNIT - 4

GROUND WATER HYDROLOGY AND WELL HYDRAULICS: Scope and importance of ground water hydrology. Aquifer parameters. Steady radial flow into wells in unconfined and confined aquifers. Types of wells, Methods of construction.

6 Hours

PART - B

UNIT - 5

STREAM FLOW MEASUREMENT: Introduction. Measurement of stage. Measurement of discharge by Area – Velocity method and slope area method. Simple stage discharge relation.

6 Hours

UNIT - 6

RESERVOIR SEDIMENTATION: ntroduction. Process of erosion. Factors affecting erosion. Sediment yield. Reservoir Sediment control. Determination of Sediment Yield at a reservoir site (Using sample recorder).

6 Hours

UNIT - 7

WATER RESOURCES: Introduction. Water wealth. River basins and their potential. Importance of water resources projects in India. Water resources development in Karnataka.

6 Hours

UNIT - 8

RAINWATER HARVESTING :Introduction. Small scale and small tank harvesting. Urban rainwater harvesting. Methods of ground water recharge.

5 Hours

TEXT BOOKS:

1. **Engineering Hydrology**- Subramanya K, Tata McGraw Hill, New Delhi.
2. **A Text Book of Hydrology**- Jayarami Reddy, Lakshmi Publications, New Delhi.

3. **Hydrology**- H.M. Raghunath, Wiley Eastern Publication, New Delhi.

REFERENCE BOOKS:

1. **Hand Book of Hydrology**- Ven Te Chow
2. **Hydrology and Water Resources Engineering**- R.K. Sharma and Sharma,, Oxford and IBH, New Delhi.
3. **Hydrology and Water Resources Engineering**- Garg S.K., Khanna Publishers, New Delhi.
4. **Applied Hydrology**- Linsley, Kohler and Paulhus, Wiley Eastern Publication, New Delhi.
5. **Ground Water Hydrology**- Todd, Wiley Eastern Publication, New Delhi.

TRANSPORTATION ENGINEERING – I

Subject Code	**: 06CV56**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of Transportation. Different modes of transportation, characteristics and comparison of different modes. Jayakar committee recommendations and implementation.

3 Hours

UNIT - 2

HIGHWAY DEVELOPMENT AND PLANNING: Road Types and classification, road patterns. Planning surveys, Master plan - saturation system of road planning, phasing road development programme Road Development in India, 1st, 2nd & 3rd 20-year road development plan and problems only on 3rd 20-year road plan. Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) – problems on best alignment among alternate proposals and phasing, Road Development Plan Vision 2021.

06 Hours

UNIT - 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.

4 Hours

HIGHWAY GEOMETRIC DESIGN 1: Importance, Factors controlling the design of geometric elements, highway cross section elements – pavement surface characteristics, camber, width of carriageway, shoulder width, formation width, right of way, typical cross section of roads.

4 Hours

UNIT - 4

HIGHWAY GEOMETRIC DESIGN 2: Sight distance, Types and importance - Design of horizontal and vertical alignment – Numerical problems on above (No derivation of formulae).

6 Hours

PART - B

UNIT - 5

PAVEMENT MATERIALS: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback, Just mention the types of tests on aggregates, bitumen and cut back for evaluating the required properties. Numerical problems on above.

6 Hours

UNIT - 6

PAVEMENT DESIGN: Types of pavements – Design factors, Determination of ESWL by equal stress criteria and problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.

5 Hours

UNIT - 7

PAVEMENT CONSTRUCTION: Specifications, construction steps and quality control tests for earthwork in cutting, filling and preparation of subgrade, Granular sub base course, Granular base / sub-base courses such as WBM, WMM, CRM, bituminous binder course (BM and DBM), common types of bituminous surfacing courses such as surface dressing, premixed carpet (PMC) and bituminous concrete and Rigid pavement (DLC and PQC).

5 Hours

HIGHWAY DRAINAGE SYSTEM: Surface and Sub-subsurface drainage system for road pavements, types, functions and basic design principles.

4 Hours

UNIT - 8

HIGHWAY ECONOMICS AND FINANCING: Highway user benefits – VOC using charts only – Highway costs – Economic analysis by annual cost

method and benefit cost ratio method, NPV and IRR methods. Numerical problems on above. Highway financing – BOT, BOOT and Annuity concepts.

5 Hours

PAVEMENT MAINTENANCE: Pavement failures, Types, Causes and remedies. Maintenance of highways. Principles of pavement evaluation – functional and structural evaluation.

4 Hours

TEXT BOOKS:

1. **Highway Engineering-** Khanna, S.K. and Justo, C.E.G., Nem Chand and Bros, Roorkee (2003).
2. **Highway Engineering**- Kadiyali, L.R., Khanna Publishers, New Delhi.
3. **Tansportation Engineering –I**- Subramanyam, K.P., Scitech Publications, Chennai.

REFERENCE BOOKS:

1. Relevant IRC codes
2. **Principles of Transportation Engineering**- Partha Chakra Borthy, Prentice-Hall.
3. **Specifications for Roads and Bridges**- MoRT&H, IRC, New Delhi (2001).

HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

Subject Code	**: 06CVL57**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

Ex 1: Calibration of V-notch
Ex 2: Calibration of rectangular or Trapezoidal notch
Ex 3: Calibration of Ogee weir
Ex 4: Calibration of Broad crested weir
Ex 5: Calibration of Venturi flume.
Ex 6: Calibration of Venturi meter.
Ex 7: Determination of Darcy's friction factor for a straight pipe.
Ex 8: Determination of minor loss constants (Bend, Sudden contraction, sudden expansion)
Ex 9: Determination of vane coefficient for flat and hemispherical vanes.
Ex 10: Determination of hydraulic coefficient of a vertical orifice.

Ex 11: Performance tests on a single stage or multi stage centrifugal pump (constant speed)
Ex 12: Performance tests on a Pleton wheel
Ex 13: Performance tests on Francis or Kaplan turbine.
Ex 14: Demonstration of working of Rain gauges.

COMPUTER AIDED DESIGN LABORATORY

Subject Code	**: 06CVL58**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. AUTOCAD

1.1 **Basics of AUTOCAD**:

DRAWING TOOLS: Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse, *Modify tools*: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, *Using Text*: Single line text, Multiline text, Spelling, Edit text, *Special Features*: View tools, Layers concept, Dimension tools, Hatching, Customising toolbars, Working with multiple drawings

3 Hours

1.2 **Use of AUTOCAD in Civil Engineering Drawings**:

Following drawings are to be prepared for the data given using AUTOCAD

i) Cross section of Foundation - masonry wall, RCC columns (isolated)
ii) Different types of staircases
iii) Lintel and chajja
iv) RCC slabs and beams
v) Drawing of Plan, elevation and sectional elevation of single storied residential and public buildings given the single line diagram and preparing excavation plan.

21 Hours

2. STRUCTURAL ANALYSIS SOFTWARE

Use of commercially available software for the analysis of

i) Propped cantilever beams
ii) Fixed beams
iii) Continuous beams
iv) 2D Portal frames-single storied and multistoried

6 Hours

3. USE OF EXCEL IN CIVIL ENGINEERING PROBLEMS

Use of spread sheet for the following civil engineering problems

i) SFD and BMD for Cantilever and simply supported beam subjected to uniformly distributed and uniformly varying load acting throughout the span
ii) Design of singly reinforced and doubly reinforced rectangular beams
iii) Computation of earthwork
iv) Design of horizontal curve by offset method
v) Design of super elevation

12 Hours

REFERENCE BOOKS:

1. **Computer Aided Design Laborator-** Dr M.N.Shesha Prakash, Dr.G.S.Suresh, Lakshmi Publications
2. **CAD Laboratory**- M.A.Jayaram, D.S.Rajendra Prasad- Sapna Publications
3. **AUTOCAD 2002-** Roberts JT, -BPB publications
4. **AUTOCAD 2004-** Sham Tickoo, A beginner's Guide, Wiley Dreamtech India Pvt Ltd.,
5. **Learning Excel 2002-** Ramesh Bangia, -Khanna Book Publishing Co (P) Ltd.,
6. **Microsoft Excel-** Mathieson SA, Starfire publishers

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	**: 06CV61**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Human activities and environmental pollution. Requirement of Water for various beneficial uses. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

UNIT - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps-Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

UNIT - 3

QUALITY OF WATER: Objectives of water quality management. Concept of safe water, wholesomeness & palatability, water born diseases. Examination of Water :- Objectives – Physical chemical and Microbiological Examinations, (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. Sampling of water for examination.

6 Hours

UNIT - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

PART - B

UNIT - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

UNIT - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

UNIT - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4 Hours

UNIT - 8

MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.

2 Hours

TEXT BOOKS:

1. **Water supply Engineering** –S.K.Garg, Khanna Publishers
2. **Environmental Engineering I** –B C Punima and Ashok Jain
3. **Manual on Water supply and treatment** –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCE BOOKS:

1. **Water Technology** – Hammer and Hammer.
2. **Environmental Engineering**- Howard S. Peavey, Donald R. Rowe, George
3. **Tchnobanoglous**, McGraw Hill International Edition.

DESIGN & DRAWING OF RC STRUCTURES

Subject Code	**: 06CV62**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) +03 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

1. Layout Drawing: General layout of building showing, position of columns, footings, beams and slabs with notations and abbreviations.
2. Beam and Slab floor system, continuous beams.
3. Staircase: Dog legged and Open well.
4. Column footing: Column and footing (Square and Rectangle).

13 (T) + 18 (D)

PART - B

1. Rectangular Combined footing slab and beam type.
2. Retaining walls (Cantilever and counter fort type).
3. Circular and Rectangular water tanks resting on ground (Flexible base and Rigid base), using IS: 3370 (Part IV) only.
4. Simple Portal Frames (Single bay & Single storey)

13 (T) + 21 (D)

REFERENCE BOOKS:

1. **Structural Design and Drawing**- Krishnamurthy -, (Concrete Structures), CBS publishers, New Delhi. Tata Mc-Graw publishers.
2. **Design of RC structures**- N. Krishnaraju, CBS publishers, New Delhi.
3. **Reinforced Concrete Structures** - B.C. Punmia – Laxmi Publishing Co.

TRANSPORTATION ENGINEERING-II

Subject Code	**: 06CV63**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

RAILWAY ENGINEERING

UNIT - 1

INTRODUCTION: Role of railways in transportation, Indian Railways, selection of routes.

1 Hour

PERMANENT WAY: Introduction, requirements for an ideal permanent way, typical cross sections of single and double line B.G. tracks – in cutting , embankment and electrified tracks. Gauges and types of gauges with dimensions. Coning of wheels and tilting of rails. Track stresses in rails, sleepers, ballast and subgrade. Problems on these. Rails functions requirements, types of rail sections, length of rails, defects in rails. Wear on rails, rail joints, welding of rails, creep of rails.

6 Hours

UNIT - 2

BALLAST AND SLEEPERS: Functions, requirements, types, track fittings and fasteners, calculation of quantity of materials needed for laying a track. Traction and tractive resistances, tractive power, Hauling capacity. Problems on above.

4 Hours

UNIT - 3

GEOMETRIC DESIGN OF TRACK: Necessity of Geometric Design of railway track, gradient and types of gradient. Speed of train, curve, transition curve, super elevation, cant- deficiency, negative cant- speed calculation based on Indian Railways Formulae for High speed tracks only-problems on above.

7 Hours

UNIT - 4

POINTS AND CROSSING: Necessity and its components, turnout, design of turnout, Types of switches, crossings, track junctions. Stations and yards, marshalling yard, signalling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards (no derivations, only relevant problems). Equipment in stations and yards such as turn-table, water columns, fouling marks, buffer stops etc.

8 Hours

PART - B

AIRPORT, TUNNELS & HARBOUR ENGINERING

UNIT - 5

INTRODUCTION: Introduction to airport engineering, Recent Development by AAI. Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications - Site selection- Regional Planning.

5 Hours

UNIT - 6

1) RUNWAY DESIGN- Orientation of runway by using wind rose diagram, the runway configurations- basic length of the runway –corrections to runway length by ICAO and FAA specification- runway cross sections- problems on above.

4 Hours

2) TAXIWAY DESIGN: Factors affecting the layout of the taxiway- geometrics of taxiway- design of Exit taxiways- ICAO Specifications. Problems on above.

3 Hours

3) VISUAL AIDS: Airport marking – lightings- ILS, other navigational aids.

2 Hours

UNIT - 7

TUNNELS: Introduction – types of tunnels, advantages and disadvantages, economics of tunnelling, tunnel surveying, transferring of centreline and gradient from the earth surface to inside the tunnel working face. Design of shape and size of tunnel. Soil classification and metods of tunnelling in soft soil (only Forepoling and Neddle Beam method). Liner Plate Method of tunnelling. Tunnelling in rock - vertical shafts, pilot tunnelling, methods of tunnelling in hard rock. Mucking and methods, drilling and drilling patterns. Tunnel lining and tunnel ventilation.

6 Hours

UNIT - 8

HARBOURS: Introductions, classifications, natural phenomenon affecting the design of harbour viz. wind, wave, tide and currents. Harbor layout with component parts, breakwaters, wharfs and Quays, Jetties and Piers, Dry Dock and Wet Dock, Slipways, Navigational aids. Warehouse and Transit shed.

6 Hours

TEXT BOOKS:

1. **Railway Engineering**- Saxena and Arora, Dhanpat Rai and Sons, New Delhi.

2. **Railway Engineering**- Satish Chandra and Agarwal, M.M., Oxford University Press, New Delhi
3. **Indian railway Track**, Agarwal M.M, Jaico Publications, Bombay.
4. **Airport Planning and Design** – Khanna, Arora and Jain – Nemchand Roorkee.
5. **Dock & Tunnel Engineering-** Srinivasan R Harbour, Charotar Publishing House.
6. **Docks and Harbor Engineering**- Oza H.P. and Oza G.H., Charotar Publishing House.

REFERENCE BOOK:

1. **Railway Track Engineering**- Antia.

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 06CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, sounding tests, geophysical methods- Electrical resistivity and Seismic refraction methods.Types of samples- undisturbed, disturbed and representative samples Samplers, sample disturbance, area ratio, Recovery ratio, clearance Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

7 Hours

UNIT - 2

DRAINAGE AND DEWATERING: Location of ground water table in fine and coarse grained soils. Determination of ground water level by Hvorselev's method. Control of ground water during exavation: Dewatering- Ditches and sumps, well point system, Shallow well system, Deep well system, Vaccum method, Electro- Osmosis method.

5 Hours

UNIT - 3

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular, rectangular, line and strip loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, contact pressure, Newmark's chart.

6 Hours

UNIT - 4

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter.Piping and protective filter, graded filter.

6 Hours

PART - B

UNIT - 5

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest, Earth pressure coefficient.

Earth pressure theories- Rankine's and Coulomb's –assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) –Culmann's and Rebhann's methods Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

8 Hours

UNIT - 6

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Fellineous method, Taylor's stability number.

7 Hours

UNIT - 7

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity.Plate load test, Standard penetration test, cone penetration test.

8 Hours

UNIT - 8

FOUNDATION SETTLEMENT: Settlement Analysis, Data for settlement analysis, computation of settlement, Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Subject Code	**: 06CV65**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition. Benefits and ill effects of irrigation. Sources of water for irrigation. Systems of irrigation : Surface and ground water, flow irrigation, Lift irrigation, Bhandhara irrigation. Methods of irrigation in India – Potential and development.

6 Hours

UNIT - 2

IRRIGATION AND WATER REQUIREMENTS OF CROPS: Definition of duty, Delta and Base period, Relationship between Duty, Delta and Base period, Factors affecting duty of water. Crops and crop seasons in India, Crops grown in Karnataka, their seasons, local names. Agro-climatic zones of Karnataka. Irrigation efficiency, Frequency of irrigation.

8 Hours

UNIT - 3

CANALS: Definition. Types of canals, Alignment of canals. Design of canals by Kennedy's and Lacey's methods.

4 Hours

CANAL WORKS: *Canal regulators*: Classification and suitability. *Canal drops:* Classification. Hydraulic design principles for notch type drop. Cross drainage works: Classification. Hydraulic design principles for an aqueduct.

4 Hours

UNIT - 4

RESERVOIRS: Definitions. Investigation for reservoir sites. Storage zones. Determination of storage capacity and yield of a reservoir using mass curve.

6 Hours

PART - B

UNIT - 5

DIVERSION WORKS: Definition. Layout. Types of weirs and Barrages. Design of Impermeable floors – Bligh's and Lane's theories – Simple design problems. Khosla's theory – Method of independent variables, Exit gradient (No design problem).

6 Hours

UNIT - 6

GRAVITY DAMS: Definition. Forces acting on a Gravity dam. Modes of failures. Elementary and practical profile. Low and high gravity dams. Simple analysis problems, Principal stresses. Drainage galleries.

8 Hours

UNIT - 7

EARTHEN DAMS: Introduction. Types of earthen dams. Failure of earthen dams. Preliminary design. Drainage arrangements. Phreatic line. Stability analysis under sudden draw down using Sweedish slip circle method.

6 Hours

UNIT - 8

SPILLWAYS: Definition. Types of Spillways. Design Principles for an Ogee Spillway. Energy dissipaters: Types and introduction to IS Stilling basins (No design problems).

4 Hours

TEXT BOOKS:

1. **Irrigation, Water Resources, and Water Power Engineering**- P.N. Modi, - Standard Book House, New Delhil.
2. **Text Book of Irrigation Engineering and Hydraulic Structures**- R.K. Sharma- Oxford and IBH Publishing Co., New Delhi.
3. **Irrigation and Water Power Engineering**- B.C. Punmia and Pande Lal, - Laxhmi Publications, New Delhi.

REFERENCE BOOKS:

1. **Irrigation Engineering and Hydraulic Structures**- S.K. Garg, - Khanna Publications, New Delhi.
2. **Irrigaiotn Theory and Practices**- Michael A.M- Vikas Publications, New Delhi.
3. **Irrigation Engineering and Hydraulic Structures**- Sahasra Budhe- Dhanpath Rai Publications, New Delhi.

MATRIX METHODS OF STRUCTURAL ANALYSIS

Subject Code	**: 06CV661**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Introduction to flexibility method, Element flexibility matrix, Principle of contragradience, and Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces.

6 Hours

UNIT - 2

Analysis of axially rigid continuous beams by flexibility method using Force Transformation Matrix

6 Hours

UNIT - 3

Analysis of rigid plane frames with axially rigid members by flexibility method using Force Transformation Matrix.

6 Hours

UNIT - 4

Analysis of trusses by flexibility method Using Force Transformation Matrix.

6 Hours

PART - B

UNIT - 5

Fundamentals of the stiffness method, equivalent joint loads, DisplacementTransformation matrix. Member stiffness matrix, Total or System stiffness matrix, Truss analysis by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 6

Continuous Beam and rigid frame analysis with axially rigid members by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 7

Introduction to direct stiffness method, Local and global co-ordinate system, Transformation Of variables, Transformation of the member displacement matrix, Transformation of the member Force matrix, Transformation of the member stiffness matrix, Transformation of the stiffness Matrix of the member of a truss, Transformation of the stiffness matrix of the member of the Rigid frame, Overall stiffness matrix, Boundary conditions, Computation of internal forces.

4 Hours

UNIT - 8

Analysis of trusses and continuous beams by direct stiffness method.

8 Hours

TEXT BOOKS:

1. **Matrix, finite elements, Computer and Structural analysis**- M Mukhopadhyay - Oxford &IBW,1984
2. **Matrix Analysis of framed structures**- W. Weaver J.M. Gere - CBS publishers and Disributers,1986
3. **Computational structural Mechanics**- S Rajshekharan. G Sankara Subramanian - PHI, 2001
4. **Structural Analysis A Matrix Approach**- G.S Pandit & S P Gupta Tata Mc Graw-Hill, 1981
5. **Basic structural Analysis**- C.S Reddy - Tata Mc Graw-Hill, 1996

REFERENCE BOOKS:

1. **Structural Analysis**- L S Negi and R S Jangid - Tata Mc Graw-Hill, 1997
2. **Introduction to Matrix Methods of Structural analysis -** H C Martin -International text book Company, 1996

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 06CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2

ALTERNATIVE BUILDING MATERIALS:

1. *Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks : mud blocks, steam cured blocks, Fal-G Blocks stone masonry block.

6 Hours

UNIT - 3

LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes
14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4

ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 Hours

PART - B

UNIT - 5

STRUCTURAL MASONRY

1. *Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7

COST EFFECTIVE BUILDING DESIGN

1. *Cost concepts in buildings
2. *Cost saving techniques in planning, design and construction
3. *Cost analysis : Case studies using alternatives.

6 Hours

UNIT - 8

EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS

1. *Machines for manufacture of concrete
2. *Equipments for production of stabilized blocks
3. *Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:

1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:

1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology**
4. 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND IMPROVEMENT TECHNIQUES

Subject Code	**: 06CV663**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GROUND IMPROVEMENT: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique.

4 Hours

MECHANICAL MODIFICATION: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.

2 Hours

UNIT - 2

COMPACTION: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behavriour like compressibility,

swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type.. Specification of compaction. Tolerance of compaction. Shallow and deep compaction.

8 Hours

UNIT - 3

HYDRAULIC MODIFICATION: Definition, aim, principle, techniques. gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering.

6 Hours

UNIT - 4

DRAINAGE & PRELOADING: Drainage of slopes., preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.

6 Hours

PART - B

UNIT - 5

CHEMICAL MODIFICATION-I: Definition, aim, special effects, and methods. Techniques – sandwich technique, admixtures, cement stabilization. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage. Criteria for cement stabilization. Stabilization using Fly ash.

6 Hours

UNIT - 6

CHEMICAL MODIFICATION-II: Lime stabilization – suitability, process, special effects, criteria for lime stabilization. Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

6 Hours

UNIT - 7

GROUTING: . Introduction, Effect of grouting. . Chemicals and materials used. Types of grouting. . Grouting procedure. . Applications of grouting.

6 Hours

UNIT - 8

MISCELLANEOUS METHODS (ONLY CONCEPTS): . Introduction, Soil reinforcement. Thermal methods.. Ground improvement by confinement – Crib walls, Gabions and Mattresses. . Anchors, Rock bolts and soil nailing.

8 Hours

TEXT BOOKS:

1. **Ground Improvement Techniques**- Purushothama Raj P. (1999) Laxmi Publications, New Delhi.

2. **Construction and Geotechnical Method in Foundation Engineering**- Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

REFERENCE BOOKS:

1. **Engineering principles of ground modification**- Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.
2. **Methods of treatment of unstable ground**- Bell, F.G. (1975) Butterworths, London.
3. **Expansive soils**- Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. **Soil Stabilization; Principles and Practice**- Ingles. C.G. and Metcalf J.B. (1972) - Butterworths, London.

ADVANCED SURVEYING

Subject Code	**: 06CV664**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT: Errors and classification of errors Precision and accuracy, Laws of weights and accidental errors.

5 Hours

UNIT - 2

PROBABILITY: Probability distribution function and density function-normal distribution. RMS error-measure of precision. Rejection of observations-principles of least squares-Normal equations.

6 Hours

UNIT - 3

METHOD OF CORRELATES: Triangulation adjustment. Angle adjustment, station adjustment and figure adjustment.

6 Hours

UNIT - 4

ELECTRONIC DISTANCE MEASUREMENT (EDM): Introduction, Electro Magnetic (EM) Waves. Phase comparison and modulations. Instruments – Geodimeter – Tellurimeter – Distomat – Range finders – Radars. Introduction to GPS Total station.

8 Hours

PART - B

UNIT - 5

FIELD ASTRONOMY: Earth celestial sphere. Solar system Position by altitude and azimuth system-spherical triangle and spherical trigonometry. Astronomical triangle. Nepiers rule.

8 Hours

UNIT - 6

TIME: Siderial time, day and year-solar time and day-Greenwich mean time-standard time. Meridian and azimuth-their determination-latitude and its determination.

6 Hours

UNIT - 7

HYDROGRAPHIC SURVEYING: Methods of soundings. Instruments. Three point problem. Tidal and Stream discharge measurem

7 Hours

UNIT - 8

SETTING OUT WORKS: Introduction. Setting out of buildings, culverts, bridge, pipeline and sewers, tunnels.

6 Hours

TEXT BOOKS:

1. **Surveying Vol I, II & III**- Punmia. B.C. - Lakshmi Publications, New Delhi.
2. **Surveying Vol I & II**- Duggal S.K. - Tata Mc Graw-Hill publishing Co.,
3. **Surveying Levelling-Part I & II** – Kanitkar T.P. & Kulkarni S.V. – Pune Vidhyarthi Gruha Prakashana.

REFERENCE BOOKS:

1. **Introduction to Surveying**- James, M. Anderson and Edward, M. Mikhail – Mc Graw Hill Book Co., 1985.
2. **Analysis and survey measurements**- M. Mikhalil and Gracie, G. - Van Nostrand Reinhold Co., (NY)-1980.
3. **Plane and Geodetic Surveying for Engineers -** David Clark -Vol I & II-**CBS** publishers and distributors, New Delhi.

GROUND WATER HYDROLOGY

Subject Code	**: 06CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2

AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3

DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4

WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5

WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.

RURAL WATER SUPPLY AND SANITATION

Subject Code	**: 06CV666**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

RURAL WATER SUPPLY: Introduction: Need for a protected water supply, investigation and selection of water sources, water borne diseases, protection of well waters, drinking water quality standards.

6 Hours

UNIT - 2

Types of pumps, supply systems viz., BWS MWS, PWS, water treatment methods – disinfection, deflouridation, hardness and iron removal, ground water contamination and control.

6 Hours

UNIT - 3

RURAL SANITATION: Conservancy, public latrine, concept of Eco-sanitation, trenching and composting methods, Two pit latrines, aqua privy, W.C, septic tank, soak pit.

8 Hours

UNIT - 4

DRAINAGE SYSTEMS: Storm water and sullage disposal, rain water harvesting and uses.

3 Hours

PART - B

UNIT - 5

COMMUNICABLE DISEASES: Terminology, classifications, methods of communication, general methods of control.

4 Hours

UNIT - 6

REFUSE COLLECTION AND DISPOSAL: Garbage, ash, rubbish, collection methods, transportation, disposal – salvaging, dumping, controlled tipping, incineration, composting, dung disposal – digester, biogas plant.

10 Hours

UNIT - 7

MILK SANITATION: Essentials, test for milk quality, pasteurization, quality control, cattle borne diseases, planning for a cow shed.

9 Hours

UNIT - 8

INSECT CONTROL: House fly and mosquito – life cycle, diseases, transmission and control measures.

6 Hours

TEXT BOOKS:

1. **Environmental Sanitation** - Joseph. A. Solveto
2. **Water Supply & Sanitary Engineering** - E.W.Steel

REFERENCE BOOK:

1. **Preventive & Social Medicine** - Park & Park

TRAFFIC ENGINEERING

Subject Code	**: 06CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2 Hours

UNIT - 2

TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali-Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo-Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal-PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

GEOTECHNICAL ENGINEERING LABORATORY

Subject Code	**: 06CVL67**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Tests for determination of specific gravity and moisture content.

3 Hours

2. Grain size analysis of soil sample (sieve analysis).

3 Hours

3. In situ density by core cutter and sand replacement methods.

3 Hours

4. Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.

3 Hours

5. Standard Proctor Compaction Test and Modified Proctor Compaction Test.

3 Hours

6. Coefficient of permeability by constant head and variable head methods.

3 Hours

7. Strength Tests
   a. Unconfined Compression Test **3 Hours**
   b. Direct Shear Test **3 Hours**
   c. Triaxial Compression Test (undrained) **3 Hours**

8. Consolidation Test- Determination of compression index and coefficient of consolidation.

4 Hours

9. Laboratory vane shear test **3 Hours**

10. Determination of CBR value **4 Hours**

11. a) Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle.
    b) Demonstration of Hydrometer Test.
    c) Demonstration of Free Swell Index and Swell Pressure Test
    d) Demonstration of determination of relative density of sands.

4 Hours

REFERENCE BOOKS:

1. **Soil Testing for Engineers**- Lambe T.W., -Wiley Eastern Ltd., New Delhi.
2. **Manual of Soil Laboratory Testing-** Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
3. **Engineering Properties of Soil and Their Measurements**- Bowles J.E. (1988), - McGraw Hill Book Co. New York.
4. **BIS Codes of Practice**: IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.

EXTENSIVE SURVEY VIVA - VOCE

Subject Code	**: 06CVL68**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

(To be conducted between 5th & 6th Semester for a period of 2 weeks, Viva voce conducted along with 6th semester exams)

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings.

1. General instructions, Reconnaissance of the sites and fly levelling to establish bench marks.

2. **NEW TANK PROJECTS:** The work shall consist of
   i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.
   ii) Capacity surveys.
   iii) Details at Waste weir and sluice points.
   iv) Canal alignment.
   (At least one of the above new tank projects should be done by using TOTAL STATION)

3. **WATER SUPPLY AND SANITARY PROJECT:** Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

4. **HIGHWAY PROJECT:** Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road**.(Drawing should be preferably done using AutoCAD)**

5. **TRIANGULATION SURVEY:** Field work to include base line measurement, observations to three stations and one satellite station.

VII SEMESTER

ENVIRONMENTAL ENGINEERING – II

Subject Code	**: 06CV71**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Necessity for sanitation, methods of domestic waste water disposal, types of sewerage systems and their suitability.

Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain. Time of concentration.

6 Hours

UNIT - 2

DESIGN OF SEWERS: Hydraulic formulae for velocity, effects of flow variations on velocity, self cleansing and non scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full (No derivations).

MATERIALS OF SEWERS: Sewer materials, shapes of sewers, laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers.

6 Hours

UNIT - 3

SEWER APPURTENANCES: Catch basins, manholes, flushing tanks, oil and grease traps, Drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage.

6 Hours

UNIT - 4

WASTE WATER CHARACTERIZATION: Sampling, significance, techniques and frequency. Physical, Chemical and Biological characteristics, Aerobic and Anaerobic activity, CNS cycles. BOD and COD. Their significance & problems

06 Hours

PART – B

UNIT - 5

DISPOSAL OF EFFLUENTS : Disposal of Effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Effluent Disposal standards for land, surface water & ocean. Numerical Problems on Disposal of Effluents. Streeter Phelps equation.

6 Hours

UNIT - 6

TREATMENT OF WASTE WATER: Flow diagram of municipal waste water treatment plant. Preliminary & Primary treatment **:** Screening, grit chambers, skimming tanks, primary sedimentation tanks – Design criteria & Design examples.

6 Hours

UNIT - 7

SECONDARY TREATMENT: Suspended growth and fixed film bioprocess. Trickling filter – theory and operation, types and designs. Activated sludge process- Principle and flow diagram, Modifications of ASP, F/M ratio. Design of ASP.

8 Hours

UNIT - 8

Anaerobic Sludge digestion, Sludge digestion tanks, Design of Sludge drying beds. Low cost waste treatment method. Septic tank, Oxidation Pond and Oxidation ditches – Design. Reuse and recycle of waste water.

8 Hours

TEXT BOOKS:

1. **Manual on Waste Water Treatment** : CPHEEO, Ministry of Urban Development, New Delhi.
2. **Water and Wastewater Engineering Vol-II** :- Fair, Geyer and Okun : John Willey Publishers, New York.
3. **Waste Water Treatment, Disposal and Reuse** : Metcalf and Eddy inc : Tata McGraw Hill Publications.

REFERENCE BOOKS:

1. **Water Technology**.- Hammer and Hammer
2. **Environmental Engineering**: Howard S. Peavy, Donald R. Rowe, George Tchnobanoglous McGraw Hill International Edition.

DESIGN OF STEEL STRUCTURES

Subject Code	**: 06CV72**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Advantages and disadvantages of Steel structures, Loads and load combinations, Structural forms, Discussions of design concepts. IS code provisions. Fire resistance and ductility of steel. Structural fasteners.

5 Hours

UNIT - 2

STRUCTURAL FASTENERS: Bolted and welded connections, HSFG Bolts, standard notations specifications strength of bolts, strength of HSFC bolts, Design of bolted connections, Brackets connections, Welds-standard notations fillet and Butt welds – Defects in welds, Strength of welds, Design of welded connections, Brackets connections.

8 Hours

UNIT - 3

DESIGN OF TENSION MEMBERS: Axially loaded tension members and their connections, design of lug angles, Design of truss ties and joints.

5 Hours

UNIT - 4

DESIGN OF COMPRESSION MEMBERS: Angle struts. Columns including built up sections, Laced and Battened systems.

8 Hours

PART - B

UNIT - 5

DESIGN OF COMPRESSION MEMBERS: Members subjected to uni-axial bending, column splicing, column bases-simple slab base, gusseted base grillage foundation.

8 Hours

UNIT - 6

DESIGN OF FLEXURAL MEMBERS: Simple and builtup sections. Laterally supported compression flange. Web crippling and web buckling, deflection.

6 Hours

UNIT - 7

DESIGN OF FLEXURAL MEMBERS: Laterally unsupported compression flange, Design of purlins.

5 Hours

UNIT - 8

TYPES OF CONNECTIONS: Beam to Beam, Beam to Column connections – bolted and welded. Framed and seated connections (moment resistant connections not included)

7 Hours

TEXT BOOKS:

1. **Design of Steel Structures**- Ramachandra - Vol - 1 & 2, Standard Book House, New Delhi.
2. **Design of Steel Structures**- Kazmi and Jindal - Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. **Design of Steel Structures**- Arya and Ajmani - Nem Chand Bros., Roorkee. IS – 800, 875, Steel tables (to be supplied in examination).
2. **Design of Steel Structures**.- Raghupathi

QUANTITY SURVEYING & ESTIMATION

Subject Code	**: 06CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – hcross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Comparative statements, acceptance of contract documents and issue of work orders. Duties and liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

8 Hours

REFERENCE BOOKS:

1. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
2. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
3. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
4. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
5. **Professional Practice for Civil Engineers**- J. Nanavati.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 06CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2

ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3

LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4

DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5

LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6

LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7

DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8

DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

TEXT BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

REFERENCE BOOKS:

1. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
2. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
3. IS : 1343 : 1980
4. **Pre-stressed Concrete**- N. Rajgopalan

THEORY OF ELASTICITY

Subject Code	**: 06CV751**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT -1

Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalised Hooke's Law, Strain- displacement relations.

5 Hours

UNIT - 2

Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials, St. Venant's principle.

8 Hours

UNIT- 3

Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, Mohr's circle of stress and strain, analytical method.

4 Hours

UNIT - 4

Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, Simply supported beam subjected to UDL.

10 Hours

PART - B

UNIT - 5

Two-dimensional problems in polar coordinates, strain-displacement relations, equations of equilibrium, compatibility equation, stress function.

8 Hours

UNIT - 6

Stress distribution symmetrical about an axis, Rotating discs, Lame's problem-thick cylinder.

5 Hours

UNIT- 7

Effect of circular holes an stress distribution in plates subjected to tension, compression and shear. Stress concentration factor, Bending of a curved bar by a force at the end.

7 Hours

UNIT - 8

Torsion: Inverse and Semi-inverse methods, stress function, torsion of circular and elliptical sections.

5 Hours

TEXT BOOKS:

1. **"Theory of Elasticity" - International Students**- Timoshenko. S.P. and Goodier. J.N. - Edition, McGraw Hill Book Co. Inc., New Delhi.
2. **Applied Elasticity**- Wang. P.C.

REFERENCE BOOKS:

1. **Contiuum Mechanics Fundamentals**- Valliappan. C : Oxford and IBH Publishing Co. Ltd., New Delhi.
2. **Advanced Mechanics of Solids**- Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.

3. **Structural Mechanics with Introduction to Elastity and Plasticity**- Venkataraman and Patel : McGraw Hill Book Inc., New York.
4. **Mechanics of Solids**- Arbind Kumar Singh : Prentice hall of India Pvt. Ltd. New Delhi -2007.

ADVANCED DESIGN OF RC STRUCTURES

Subject Code	**: 06CV752**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
Design of RCC overhead circular and rectangular water tanks with supporting towers.

8 Hours

UNIT - 2
Design of silos, bunkers using Janssen's Theory and Airy's Theory.

7 Hours

UNIT - 3
Design of RCC Chimneys.

6 Hours

UNIT - 4
Introduction to shell and folded plate roofs, their forms and structural behaviour. Design of simple cylindrical shell roof by beam theory.

6 Hours

PART - B

UNIT - 5
Yield line analysis of slabs by virtual work.

7Hours

UNIT - 6
Yield line analysis by equilibrium methods.

6 Hours

UNIT - 7
Design of Grid Floors Slabs by approximate method.

6 Hours

UNIT-8

Design of flat slabs by Direct Designer Method (with and without drops)

6 Hours

TEXT BOOKS:

1. **Reinforced Concrete Structures, Vol-II**- B C Punmia : Laxmi Publications (P) Ltd, New Delhi.
2. **Limit State Design of Reinforced Concrete Vol-II**- P C Varghese: Prentice Hall of India (P) Ltd, New Delhi.

REFERENCE BOOKS:

1. **Plain and Reinforced Concrete – Vol-II**- Jai Krishna and Jain,: Nem Chand Bros, Roorkee.
2. **Analysis of Structures- Vol-II** : Vazirani V N & M M Ratwani : Khanna Publishers, New Delhi.
3. **Design Construction of Concrete Shell Roofs** : Ramaswamy G S : CBS Publishers and Distributors, new Delhi.
4. **Advanced Structural Design**- Bensen C
5. IS 456 – 2000 IS 3370 – 1967 (Part I, II and IS 1893)
6. **Advanced RCC Design- Vol-II**,- S. S. Bhavikatti New Age International Publication, New Delhi.

STRUCTURAL DYNAMICS

Subject Code	**: 06CV753**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement.

6 Hours

UNIT - 2

Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading, rotation unbalance, reciprocating unbalance.

6 Hours

UNIT - 3

Duhamel's integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.

7 Hours

UNIT - 4

Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthoganality property of normal modes, eigen values.

7 Hours

PART - B

UNIT - 5

Shear buildings modeled as multi degree of freedom systems, free vibrations, natural frequencies.

6 Hours

UNIT - 6

Forced vibration motion of shear builings, modal super position method, response of shear buldings to base motion, harmonic forced excitation.

6 Hours

UNIT - 7

Damped motion of shear buildings, equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupling.

7 Hours

UNIT - 8

Dynamic analysis of beams stiffness matrices, lumped mass and consistent mass formulation equations of motion.

7 Hours

TEXT BOOKS:

1. **Vibrations, structural dynamics**- M. Mukhopadhaya : Oxford IBH
2. **Structural Dynamics**- Mario Paz : CBS publishers.
3. **Structural Dynamics**- Anil Chopra : PHI Publishers.

REFERENCE BOOK:

1. **Structural Dynamics**- Clough & Penzen : TMH.

EARTH & EARTH RETAINING STRUCTURES

Subject Code	**: 06CV754**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

EARTH STRUCTURES: Introduction about earthen dams and embankments- different types of earthen dams with sketches and their suitability. Hydraulic fill and rolled fill methods of construction – causes of failure of earth dam – Design criteria of earth dams – Stability analysis of earthen dams – Seepage control in earthen dams. Role of Filters in Earth Dam Design.

7 Hours

UNIT - 2

RETAINING WALLS: Instroduction, failure of retainig walls by sliding overturning and bearing. Stability analysis and Principles of the design of retaining walls – Gravity retaining walls, cantilever retaining walls, counterfort retaining walls (no structural design) – Other modes of failure of retaining walls – Drainage from the backfill.

7 Hours

UNIT - 3

BULK HEADS: Cantilever sheet pile walls Introduction - Types of sheet pile walls – Free cantilever sheet pile - cantilever sheet pile in cohesion-less soils – cantilever sheet pile penetrating in clay.

6 Hours

UNIT - 4

BULK HEADS: Anchored Sheet Pile Walls: Anchored sheet pile with free earth support in cohesion-less and cohesive soil. bulkheads with fixed earth support method – Types, locations and design of anchors.

6 Hours

PART - B

UNIT - 5

BRACED CUTS: Introduction, Lateral earth pressure on seatings. Different types of sheeting and bracing systems – design of various components of bracings.

7 Hours

UNIT- 6

ROCK FILL DAMS: Introduction, Origin and usage of rock fill dams, types of rock fill dams, design of rock fill dams and construction of rock fill dams.

6 Hours

UNIT- 7

COFFER DAMS & CELLULAR COFFER DAMS I: Introduction – types of coffer dams - Design of cellular coffer dams on rock by Tennesse Valey Authority (TVA) method – safety against sliding, slipping, overturning, vertical shear and stability against bursting.

7 Hours

UNIT- 8

CELLULAR COFFER DAMS II: Design of cellular coffer dam on soil - safety against sliding, slipping, overturning, vertical shear and stability against bursting.

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engineering** : Dr. K.R. Arora : Pub : Standard Publishers & Distributors.
2. **Soil Mechanics and Foundation Engineering,** : S.K. Garg : Pub : Khanna Publishers.

REFERENCE BOOKS:

1. **Soil Mechanics and Foundation Engineering,**: Dr. B.C. Punmia : Pub : Laxmi Publications Ltd.,
2. **Foundation Engineering.**: Dr. B.J. Kasmalkar
3. **Numericals in Geotechnical Engineering** : A.V. Narasimha Rao & C. Venkataramaiah :Pub : University Press.
4. **Hydraulic Structures**: S.K. Garg : Pub : Khanna Publishers.
5. **Soil Mechanics and Foundation Engineering,** : Dr. V.N.S. Murthy : Pub : Sai Tech.
6. **Geotechnical Engineering,** : Dr. C. Venkataramaiah : Pub : New age publications.
7. **Geotechnical Engineering** : Purushotam Raj .
8. **Theory and Practice of Soil Engineering** : Alum Singh .

HIGHWAY GEOMETRIC DESIGN

Subject Code	**: 06CV755**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Geometric Control factors like Topography -design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – factors controlling PCU for different design purpose

6 Hours

UNIT - 2

CROSS SECTIONAL ELEMENTS: Pavement surface characteristics – friction – skid resistance – pavement unevenness - light reflecting characteristics – camber – objectives – types of camber – methods of providing cambers in the field – problems – carriage way – kerb – median – shoulder – foot path – parking lanes – service roads – cycle tracks – Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest I RC provisions.

10 Hours

UNIT - 3

SIGHT DISTANCE: Importants, types, Side distance at uncontrolled intersection, derivation, factors affecting side distance, IRC, AASHTO standards, problems on above.

6 Hours

UNIT - 4

HORIZONTAL ALIGNMENT: Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves – objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above

8 Hours

PART - B

UNIT - 5

VERTICAL ALIGNMENT: Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD

– Night visibility considerations – Design standards for hilly roads – problems on the above.

5 Hours

UNIT - 6

INTERSECTION DESIGN: Principle – Atgrade and Grade separated junctions – Types – channelization – Features of channelising Island – edian opening – Gap in median at junction.

6 Hours

UNIT - 7

ROTARY INTERSECTION: Elements – Advantages – Disadvantages – Design guide lines – problem on the above – Grade separated intersection – Three legged inter section – Diamond inter change – Half clover leaf – clover leaf- Advantages- Disadvantages only

6 Hours

UNIT - 8

HIGHWAY DRAINAGE: Importance – sub surface drainage –surface drainage – Design of cross sections – Hydrological – Hydraulical considerations and design of filter media, problems on above.

5 Hours

TEXT BOOKS:

1. **Principle and practice of Highway Engineering**- L R KADIYALI & N B LAL : Khanna publications
2. **Highway Engineering** – Khanna S K & Justo, Nemchand & Bros.

REFERENCE BOOKS:

1. **Highway Engineering**- Kadiyali L R : Khanna publications
2. **Relavent IRC** Publications
3. **Transportation Engineering and Planning**- Papa Coastas and Prevendors PHI, New Delhi.

OPEN CHANNEL HYDRAULICS

Subject Code	**: 06CV756**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors.

8 Hours

UNIT - 2

UNIFORM FLOW: Concepts, uniform flow equations, conveyance and hydraulic exponent for uniform flow, design of channels for uniform flow.

8 Hours

UNIT - 3

CRITICAL FLOW: Concept of specific Energy – Classification of flow. Design of channel, Section Factor, Hydraulic exponent for critical flow critical depth as a flow measurement.

6 Hours

UNIT - 4

GRADUALLY VARIED FLOW: Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation, Characteristics of flow profile and classification.

6 Hours

PART - B

UNIT - 5

Analysis of flows profiles, Method of singular point and transitional depth, Methods of computation, Practical problems.

6 Hours

UNIT - 6

Gradually Varied Flow Computations: Different methods, direct integration method, Bress's Solution, Chow's solution, direct method, standard step method.

8 Hours

UNIT - 7

Rapidly Varied Flow: Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length location height, application of hydraulic jump stilling basins, shape type-2 and type-4.

6 Hours

UNIT - 8

Hydraulic jump in rectangular channels, Sloping channels, Jump in non rectangular channels, application of hydraulic jump as energy desipator

4 Hours

TEXTBOOKS:

1. **Open Channel Hydraulic** : Ven Te Chow : Mc Graw Hill Book Company, New Delhi.
2. **Flow through Open Channel** : R G Rangaraju : Tata McGraw Hill Publishing Co Ltd, New Delhi.

REFERENCE BOOKS:

1. **Open Channel Hydraulics** : Subramanya : Tata Mc Graw Hill Publishing Co Ltd, New Delhi.
2. **Open Channel Hydraulics** : French : Mc Graw Hill Book Company, New Delhi.
3. **Fluid Mechanics** : Modi and Seth : Standard Book Home, New Delhi.
4. **Open Channel Hydraulics** : Henderson : Mr. Millan Publishing Co. Ltd., New York.

SOLID WASTE MANAGEMENT

Subject Code	**: 06CV757**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, Land Pollution – scope and importance of solid waste management, functional elements of solid waste management.

SOURCES: Classification and characteristics – municipal, commercial & industrial. Methods of quantification.

08 Hours

UNIT - 2

COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, garbage chutes, transfer stations – bailing and compacting, route optimization techniques and problems.

06 Hours

UNIT - 3

TREATMENT / PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction, chemical reduction and biological processing problems.

6 Hours

UNIT - 4

INCINERATION: Process – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolsis, design criteria for incineration.

7 Hours

PART - B

UNIT - 5

COMPOSTING: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes. Vermicomposting.

6 Hours

UNIT - 6

SANITARY LAND FILLING: Different types, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geosynthetic fabrics in sanitary land fills.

8 Hours

UNIT - 7

DISPOSAL METHODS: Open dumping – selection of site, ocean disposal, feeding to hogs, incineration, pyrolsis, composting, sanitary land filling, merits and demerits, biomedical wastes and disposal.

6 Hours

UNIT - 8

RECYCLE AND REUSE: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.

5 Hours

TEXT BOOKS:

1. **Integrated Solid Waste Management:** Tchobanoglous : M/c Graw Hill.
2. **Solid Waste Management in developing countries.** Bhide and Sunderashan

REFERENCE BOOKS:

1. **Hand book on Solid Waste Disposal**.: Pavoni J.L.
2. **Environmental Engineering**.: Peavy and Tchobanoglous
3. **Environmental Engineering – Vol II.**: S.K. Garg
4. **Biomedical waste handling rules** – 2000.

NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code	**: 06CVL 761**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART -A

UNIT - 1

INTRODUCTION: Historical development of Numerical techniques, role in investigations, research and design in the field of civil engineering

1 Hour

DEVELOPMENT OF ALGORITHM/ FLOW CHARTS FOR FOLLOWING METHODS FOR SOLUTION OF LINEAR SIMULTANEOUS EQUATION:

a) Gaussian elimination method,
b) Gauss-Jordan matrix inversion method,
c) Gauss-Siedel method and
d) Factorization method

6 Hours

UNIT - 2

APPLICATION OF SOLUTION OF LINEAR SYSTEM OF EQUATIONS TO CIVIL ENGINEERING PROBLEMS : Construction planning, slope deflection method applied to beams, frames and truss analysis.

5 Hours

UNIT - 3

APPLICATION OF ROOT FINDING TO CIVIL ENGINEERING PROBLEMS: Development of algorithm for a) Bisection method and b) Newton-Raphson method and its applications for solution of non linear algebraic and transcendental equations from problems in hydraulics, irrigation engineering, structural engineering and environmental engineering.

6 Hours

UNIT - 4

APPLICATION OF NUMERICAL INTEGRATION FOR SOLVING SIMPLE BEAM PROBLEMS: Development of algorithm for a) Trapezoidal rule and b) Simpson's one third rule and its application for computation of area of BMD drawn for statically determinate beams.

6 Hours

PART -B

UNIT - 5

New Marks method for computation of slopes and deflections in statically determinate beams.

6 Hours

UNIT - 6

DEVELOPMENT OF ALGORITHM AND APPLICATION OF SOLUTION OF ORDINARY DIFFERENTIAL EQUATION TO CIVIL ENGINEERING PROBLEMS BY: a) Euler's method b) Runge Kutta 4th order method

7 Hours

UNIT - 7

APPLICATION OF FINITE DIFFERENCE TECHNIQUE IN STRUCTURAL MECHANICS: i. Introduction, expression of derivatives by finite difference: backward differences, forward differences and central differences. ii. Application of finite difference method for analysis of
a) statically determinate beams, b) statically indeterminate beams

8 Hours

UNIT - 8

Application of Finite difference technique in structural mechanics (Contd..)
a) Buckling of columns, b) Beams on elastic foundation.

7 Hours

TEXT BOOKS:

1. **Numerical Methods for Engineers**- Chapra S.C. & R.P.Canale : McGraw Hill, 1990.
2. **Numerical methods in Engineering Problem-** N.Krishna Raju, K.U.Muthu : MacMillan Indian Limited, 1990.

REFERENCE BOOKS:

1. **Numerical methods for Engineers and Scientists**- Iqbal H.Khan, Q. Hassan : Galgotia, New Delhi, 1997.
2. **Numerical methods in Computer Programs in C^{++}"** - Pallab Ghosh : Prentice Hall of India Private Limited, New Delhi, 2006.
3. **Numerical methods for engineers using MATLAB and C – I** Edition SCHILLING " Thomson Publications"

ROCK MECHANICS

Subject Code	**: 06CV762**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Engineering classification of rock – RQD, RMR system, Terzaghi's rock load classification Deere Miller, CMRS and RSR System.

7 Hours

UNIT - 2

ROCK DISCONTINUITY QUALITATIVE DESCRIPTION, FRICTION IN ROCKS – Amonton's law of friction.

5 Hours

UNIT - 3

Engineering properties of intact rock, importance, Evaluation

6 Hours

UNIT - 4

Laboratory testing of rocks uniaxial compression, uniaxial tension, triaxial compression, extension in trixial test, torsion, bending, diametral compression of cylinders – Protodyknov test, Brazilian test and shear test

8 Hours

PART - B

UNIT - 5

Insitu properties determination – shear strength, deformability and perculation of rock masses.

6 Hours

UNIT - 6

Insitu state of stress – flat jack method, measurement in borehole with gauges, Large scale compression tests – stress relieving techniques.

6 Hours

UNIT - 7

Structural defects in Rock masses, their improvement by rock bolting, grouting and other methods.

6 Hours

UNIT - 8

Mining and other Engineering applications, criteria for design of underground excavations, energy released, tubular excavations, pillars and ribs support multiple excavations.

8 Hours

TEXT BOOKS:

1. **Foundation of Rock masses** - Joegar and Cook : 3rd Edition Chapman and Hall, London.
2. **Introduction to rock mechanics**- Goodman : : Wiley International.

REFERENCE BOOKS:

1. **Rock Mechanics and the design of structures in Rock**- : John Wiley, New York.
2. **Rock Mechanics in Engineering practice**- Ziekiewicz. O.C. and Stagg K.G. : John, Wiley, New York.

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 06CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

PAVEMENT MATERIALS

UNIT - 1

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending to meet specification.

6 Hours

UNIT - 2

BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3

BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4

BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and specification using different criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

PHOTOGRAMMETRY AND REMOTE SENSING

Subject Code	**: 06CV764**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

PHOTO GRAMMETRY: Introduction – Basic Principles – Photo theodolite – Definitions – Horizontal and Vertical angle from teerestial photograph – Horizontal position of a point from photo graphic measurement from camera horizontal axis – Elevation of point by photographic measurement – focal length.

7 Hours

UNIT - 2

AERIAL CAMERA – SCALE OF PHOTOGRAPH – Determination of height of lens for a vertical photograph – Relief displacement – Scale of tilted photograph – computation of a length of line between points of different elevation from measurement on a tilted photograph.

5 Hours

UNIT - 3

DETERMINATION OF FLYING HEIGHT FOR A TILTED PHOTOGRAPH – Tile distortion – Relief displacement – Combined effect of tile and relief – flight planning for Aerial Photogrammetry, Ground control – Stereoscopic vision – Drift mosaics, Relevant numerical examples in the above topics.

5 Hours

UNIT - 4

REMOTE SENSING – Introduction – Historical sketch of Remote Sensing – Idealized remote sensing – Basic principles of remote sensing – Electro magnetic energy Electromagnetic spectrum- Wave length regions and their application in remote sensing – characteristics of solar radiation – Basic

radiation law – EM radiation and atmosphere – Interaction of EM radiation with earth surface – Remote sensing observation platforms – sensors – Application of Remote Sensing.

6 Hours

PART - B

UNIT - 5

GEOGRAPHICAL INFORMATION SYSTEM, DEFINITION: The four M's concept – contributing disciplines for GIS, GIS objectives – components of a GIS – Topoligy – Data models – Data structures – Data base management – Errors in GIS – GIS software packages – Linkage of GIS to remote sensing – Application areas of GIS and Remote sensing.

8 Hours

UNIT - 6

FIELD ASTRONOMY: Definitions of astronomical terms – co-ordinate systems – Terrestrial attitude and longitude – Spherical Trignometry and Spherical Triangle – Astronomical Triangle – relationship between co-ordinates – Earth and Sun units of time. - Relationship between degrees and hours of the time. Conversion of local time standard time and vice versa.

8 Hours

UNIT - 7

Conversion of Meantime interval to Sindereal time interval and vice-versa – Estimation of local mean midnight at any place on the same date.

6 Hours

UNIT - 8

Determination of LST from given value of LMT – Determination of LMT from the given value of LST-LMT of star across median given GST and GMN – Detrmination of Azimuth, latitude and longitude – Relevant numerical exmplaes.

7 Hours

TEXT BOOKS:

1. **Higher Surveying**- Dr. B. C. Punmia Ashok K Jain – Arun K Jain – Arun K Jain : Surveying III : Lakshmi Publication.
2. **Element of Photogrammetry** - Paul R Wolf : Mc Graw Hill Internation
3. **GIS studies** - Korte : Thomson Publications, New Delhi.
4. **Remote Sensing & Interpretation** - Lille Sand: Wiley Publications.

REFERENCE BOOKS:

1. **Remote Sensing Gelogy**- Ravi Gupta : Springer Verlog (NY)
2. **Surveying & Levelling**- R. Subramanian : Oxford University Press.

AIR POLLUTION AND CONTROL

Subject Code	**: 06CV765**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition – Classification and Characterization of Air Pollutants,

Emission Sources, Behavior and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo-chemical Smog, Coal-induced smog, Air Pollution Inventories.

6 Hours

UNIT - 2

EFFECTS OF AIR POLLUTION: On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

6 Hours

UNIT - 3

METEOROLOGY: Introduction – Meteorological Variables, Primary and Secondary Lapse Rate, Inversions, Stability Conditions, Windrose, General Characteristics of Stack Plumes, Meterological Models.

10 Hours

UNIT - 4

Industrial Plant Location and Planning

2 Hours

PART - B

UNIT - 5

SAMPLING, ANALYSIS AND CONTROL: Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement, Air Pollution Control Methods – Particulate, Emission Control, Gravitational Settling Chambers, Cyclone

Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions, Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

16 Hours

UNIT - 6

AIR POLLUTION DUE TO AUTOMOBILES: Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

5 Hours

UNIT - 7

BURNING ENVIRONMENTAL ISSUES:

1. Acid Rain
2. Global Warming
3. Ozone Depletion in Stratosphere
4. Indoor Air Pollution

4 Hours

UNIT - 8

STANDARDS AND LEGISLATION: Air Quality and Emission Standards – Legislation and Regulation, Air Pollution Index.

3 Hours

REFERENCE BOOKS:

1. **Air Pollution** - Henry C. Perkins : McGraw Hill Ltd.
2. **Air Pollution** – Sampling and Analysis – APHA.
3. **Air Pollution** – Its origin and control. Harper and Row: Wark. K. and Warner. F. publishers, New York.

DESIGN AND DRAWING OF BRIDGES

Subject Code	**: 06CV766**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) + 3 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

UNIT - 1

BRIDGE PRELIMINARIES: Classification of bridges and standard loads, Bridge-definition, components of bridges, various classification, types of bridges, forces to be considered for the design, IRC standards.

HYDRAULIC DESIGN: Methods of finding design discharge, natural, artificial and linear water ways, afflux, economic span.

SUBSTRUCTURES AND FOUNDATIONS: Types of abutments, piers and wing walls, forces to be considered for the design, Types of foundations and forces to be considered for the design, depth of scour.

6 Hours

UNIT - 2

DESIGN AND DRAWING OF RC SLAB CULVERT for IRC class-AA loading, & class A loading. Design of pipe culvert. Empirical design of bank connections. Drawing slab culvert & pipe culvert for given site particulars.

6+12 Hours

PART - B

UNIT - 3

DESIGN AND DRAWING OF RC T BEAM BRIDGE with cross beams by Piegaud's and Courbon's method for class-AA loading, empirical design of substructures and foundations.

5+12 Hours

UNIT - 4

DESIGN OF COMPOSITE BRIDGE: Design of composite bridge for EUDL, Shear connectors-design requirments for shear connectors. Drawing of composite bridge.

5+9 Hours

UNIT - 5

Typical Design and detailing of approach slab, Hand rails- Typical design and detailing of slab culverts and girder bridges as per MOT standards

4+6 Hours

TEXT BOOKS:

1. **Essentials of Bridge Engineering** : Johnson – victor : Oxford IBH Publications, New Delhi.
2. **Design of Bridges** : Krishna Raju N : Oxford IBH Publications, New Delhi.

REFERENCE BOOK:

1. **Design of Bridge Structures** : Jagadish T. R. & Jayaram M. A. : Prentice Hall of India, New Delhi.

DESIGN OF MASONRY STRUCTURES

Subject Code	**: 06CV767**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MASONRY UNITS, MATERIALS, TYPES & MASONRY CONSTRUCTION: Brick, stone and block masonry units – strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks.

6 Hours

UNIT - 2

STRENGTH AND STABILITY: Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression.

6 Hours

UNIT - 3

PERMISSIBLE STRESSES: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.

6 Hours

UNIT - 4

DESIGN CONSIDERATIONS: Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels.

8 Hours

PART - B

UNIT - 5

LOAD CONSIDERATIONS FOR MASONRY: Wall carrying axial load, eccentric load with different eccentricity ratios, walls with openings, free standing wall.

6 Hours

UNIT - 6

DESIGN OF MASONRY WALLS: Design of load bearing masonry for building up to 3 storeys using IS : 1905 and SP : 20 procedure.

10 Hours

UNIT - 7

REINFORCED MASONRY: Application, flexural and compression elements, shear walls.

5 Hours

UNIT - 8

MASONRY WALLS IN COMPOSITE ACTION: Composite wall-beam elements, infilled frames.

5 Hours

TEXT BOOKS:

1. **Structural Masonry**- Henry, A.W. : Macmillan Education Ltd., 1990.
2. **Brick and Reinforced Brick Structures**- Dayaratnam P. : Oxford & IBH, 1987.

REFERENCE BOOKS:

1. **Design of masonry structures**- Sinha B.P. Davies S.R. : E&FN spon 1997
2. IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi.
3. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1st revision) BIS, New Delhi.

ENVIRONMENTAL ENGINEERING LABORATORY

Subject Code	**: 06CVL77**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Determination of Solids in Sewage: Total Solids, Suspended Solids,Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.

2. Electrical conductivity. Determination of Chlorides and Sulphates.

3. Determination of Alkalinity, Acidity and pH.

4. Determination of Calcium, Magnesium and Total Hardness.

5. Determination of Dissolved Oxygen. Determination of BOD.

6. Determination of COD.

7. Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.

8. Jar Test for Optimum Dosage of Alum, Turbidity determination by Nephelometer.

9. Determination of Iron. Phenanthroline method.

10. Determination of Fluorides SPANDS Method.

11. MPN Determination

12. Determination Nitrates by spectrophotometer.

13. Determination of sodium and potassium by flame photometer.

REFERENCE BOOKS:

1. **Manual of Water and Wastewater Analysis** – NEERI Publication.
2. **Standard Methods for Examination of Water and Wastewater** (1995), American Publication – Association, Water Pollution Control Federation, American Water Works Association, Washington DC.
3. **IS Standards :** 2490-1974, 3360-1974, 3307-1974.
4. **Chemistry for Environment Engineering**. Sawyer and Mc Carthy,

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	**: 06CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity. Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.
2. **Highway Material Testing Laboratory Manual** – Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 06CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
4. ACI Code for Mix Design
5. IS 10262-2004
6. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
7. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi

REFERENCE BOOKS:

1. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
2. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
3. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
4. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
5. **Properties of Fresh Concrete**- Power T.C.- E and FN, London
6. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.

DESIGN AND DRAWING OF STEEL STRUCTURES

Subject Code	**: 06CV82**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) + 3 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

(DRAWINGS TO BE PREPARED FOR GIVEN STRUCTURAL DETAILS)

UNIT - 1

CONNECTIONS: Bolted and welded, beam-beam, Beam-column, seated, stiffened and un-stiffened.

UNIT - 2

COLUMNS: Splices, Column-column of same and different sections. Lacing and battens.

UNIT - 3

COLUMN BASES: Slab base and gusseted base, grillage foundation.

13 (T) + 18 (D)

PART - B

UNIT - 4

Design and drawing of

i) Bolted and welded plate girder
ii) Roof Truss (Forces in the members to be given)
iii) Gantry girder

13 (T) + 21 (D)

REFERENCE BOOKS:

1. **Design of Steel Structures** - Ramachandra -Standard Book House, 1705- A, Nai Sarak, Delhi-6.
2. **Design of Steel Structures** - Dayarathnam P - A.H. Wheeler & Co. Ltd.
3. **Design of Steel Structures** - Negi - Tata Mc Graw Hill Publishers.
4. **Design of Steel Structures** - Arya and Ajaman- Nem Chand & Bros. Roorkee.
5. **Design of Steel Structures.-** Raghupati
6. IS : 80 – 1984, SP 6 (1) – 1984 or Steel Table.
7. **Detailing of Structures-** Dayarathnam P
8. **Design of Steel Structures** - N. Subramanian : Oxford University, Press.

ADVANCED PRESTRESSED CONCRETE STRUCTURES

Subject Code	**: 06CV831**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ANCHORAGE ZONE STRESSES IN POST-TENSIONED MEMBERS: Introduction, stress distribution in end block, investigations on Anchorage zone stresses, Magnel and Guyon's Methods, Comparative Analysis, Anchorage zone reinforcement.

6 Hours

UNIT - 2

SHEAR AND TORSIONAL RESISTANCE: Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, Torsion, Design of reinforcement for torsion, shear & bending.

6 Hours

UNIT - 3

COMPOSITE BEAMS: Introduction, Composite structural members, types of composite construction, analysis of stresses, differential shrinkage, deflection, serviceability limit state, flexural strength, shear strength design.

8 Hours

UNIT - 4

TENSION MEMBERS: Introduction, Ties, pressure pipes – fabrication process, analysis, design and specifications, cylindrical containers-construction Techniques, analysis, Design and specifications, Ring beams.

6 Hours

PART - B

UNIT - 5

STATICALLY INDETERMINATE STRUCTURES: Introduction, Advantages of continuous members, effect of prestressing indeterminate structures, methods of analysis of secondary moments, concordant cable profile, Guyon's theorem, Ultimate load analysis, Determination of concordant tendon profile, Design of continuous beams and portal frames.

8 Hours

UNIT - 6

COMPRESSION MEMBERS: Introduction, Columns, short columns, long columns, biaxially loaded columns, Design specification.

6 Hours

UNIT - 7

SLAB AND GRID FLOORS: Types of floor slabs, Design of one way and two way slabs. Flat slabs-Indian code and distribution of prestressing tendons, Analysis and design of grid floors.

5 Hours

UNIT - 8

PRECAST ELEMENTS: Introduction, Prestressed concrete poles-manufacturing techniques, shapes and cross sectional properties, design loads, design principles, Railway sleepers-classification and Manufacturing techniques, design loads, analysis and design Principles, Prestressed concrete pavements, slab and wall panels.

7 Hours

TEXT BOOKS:

1. **Design of Prestressed concrete structures** - Lin T.Y. and H. Burns - John Wiley & Sons, 1982.
2. **Prestressed Concrete**- N. Krishna Raju - Tata Megrahill, 3rd edition, 1995.

REFERENCE BOOKS:

1. **Prestressed Concrete Structures**- P. Dayaratnam - Oxford & IBH, 5th Edition, 1991.
2. **Prestressed Concrete**- G.S. Pandit and S.P. Gupta - CBS Publishers, 1993.
3. IS : 1343 : 1980.

ADVANCED FOUNDATION DESIGN

Subject Code	**: 06CV832**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SHALLOW FOUNDATIONS (PART 1): Presumptive bearing capacity according to BIS, Factors affecting bearing capacity Factors influencing selection of depth of foundation, types of shallow foundations Settlement of Shallow Foundations : Immediate, consolidation, & differential settlements.

6 Hours

UNIT - 2

SHALLOW FOUNDATIONS (PART 2): Principles of Design of footing, Proportioning of footings for equal settlement. Design of isolated footing, combined footing, Strap footing, Strip footing and Raft (Proportioning only).

6 Hours

UNIT - 3

PILE FOUNDATIONS (PART 1): Introduction Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test and Penetration tests.

6 Hours

UNIT - 4

PILE FOUNDATIONS (PART 2) PILE GROUPS: Introduction, Pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction & under reamed piles.

7 Hours

PART - B

UNIT - 5

WELL FOUNDATIONS: Introduction, Different shapes and characteristics of wells. Components of well foundation. Forces acting on well foundation. Sinking of wells. Causes and remedies of tilts and shifts.

6 Hours

UNIT - 6

DRILLED PIERS & CAISSONS: Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.

7 Hours

UNIT - 7

FOUNDATIONS ON EXPANSIVE SOILS: Introduction, Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and Swell pressure, Free swell, CNS layer, foundation treatment for structures in expansive soil.

6 Hours

UNIT - 8

MACHINE FOUNDATIONS: Introduction, Types of Machine foundations, basic definitions, degree of freedom of a block foundaiton, general creteria for design of machine foundation, free and forced vibrations, vibration analysis of a machine foundation, determination of natural frequency, vibration isolation and control.

8 Hours

TEXT BOOKS:

1. **Soil Mechanics & Foundation Engineering** - V.N.S. Murthy - Pub: Sai Tech.
2. **Foundation Engineering** - Braja M. Das - Thomson.

3. **Soil Mechanics Foundations** - Dr. B.C. Punmia - Pub : Laxmi publications, pvt. Ltd.
4. **Foundation Analysis and Design** - Bowles J.E. (1996) - 5th Ed, McGraw Hill Pub. Co., New York.
5. **Advanced Foundation Engineering** - V.N.S. Murthy - Pub : Sai Tech.

REFERENCE BOOKS:

1. **Pile Foundation**.- Chellies
2. **Geotechnical Engineering.-** P. Purushotham Raj
3. **Geotechnical Engineering** - Dr. C. Venkataramaiah - Pub : New age Publications.
4. **Foundation Engineering** - Dr. P.C. Varghese :- Pub : Prentice Hall of India.

PAVEMENT DESIGN

Subject Code	**: 06CV833**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Desirable characteristics of pavement, types and components, Difference between Highway pavement and Air field pavement – Design strategies of variables – Functions of sub-grade, sub base – Base course – surface course – comparison between Rigid and flexible pavement.

6 Hours

UNIT - 2

FUNDAMENTALS OF DESIGN OF PAVEMENTS: Design life – Traffic factors – climatic factors – Road geometry – Subgrade strength and drainage, Stresses and deflections, Boussinesqs theory – principle, Assumptions – Limitations and problems on above - Busmister theory – Two layered analysis – Assumptions – problems on above

6 Hours

UNIT - 3

DESIGN FACTORS: Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept.

6 Hours

UNIT - 4

FLEXIBLE PAVEMENT DESIGN: Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – IRC Method (old) - CSA Method using IRC 37-2001, problems on above.

6 Hours

PART - B

UNIT - 5

STRESSES IN RIGID PAVEMENT: Principle – Factors - wheel load and its repetition – properties of sub grade - properties of concrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis – Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above.

6 Hours

UNIT - 6

DESIGN OF RIGID PAVEMENT: Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tendem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above

8 Hours

UNIT - 7

FLEXIBLE PAVEMENT FAILURES, MAINTENANCE AND EVALUATION: Types of failures, causes, remedial/maintainance measures in flexible pavements – Functional Evaluation by visual inspection and unevenness measurements - Structural Evaluation by Benkelman Beam Deflection Method, Falling weight deflectometer, GPR Method. Design factors for Runway Pavements - Design methods for Airfield pavements and problems on above.

7 Hours

UNIT - 8

RIGID PAVEMENT FAILURES, MAINTENANCE AND EVALUATION: Types of failures, causes, remedial/maintainance measures in regid pavements – Functional Evaluation by visual inspection and unevenness measurements. Design factors for Runway Pavements - Design methods for Airfield pavements.

7 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna & Justo
2. **Principles & Practices of Highway Engineering**- L R Kadiyalli & N B. Lal

3. **Pavement Analysis & Design** - Yang H. Huang- II edition.
4. Relavent IRC codes

REFERENCE BOOKS:

1. **Principles of Pavement Design**- Yoder and Witzack - 2nd edition, John Wileys and Sons
2. **Principles of Pavement Design**- Subha Rao

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Subject Code	**: 06CV834**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

EARTHQUAKE GROUND MOTION ENGINEERING SEISMOLOGY – Introduction, Theory of plate tectonics, seismic waves, earthquake size, local site effects, seismic zoning map of India.

6 Hours

UNIT - 2

Evaluation & Seismic Design ParametersTypes of Earthquakes, earthquake ground motion, characteristics, response spectra and design spectrum.

6 Hours

UNIT - 3

Basic elements of Earthquakes Resistant Design Structural modelling, seismic method of analysis – code based procedures, seismic design methods – code based methods. Response control concepts, seismic education and retrofitting seismic test methods.

6 Hours

UNIT - 4

Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seismo resistant building architecture – lateral load resistant systems, building configuration, building characteristics.

6 Hours

PART - B

UNIT - 5

Determination of design lateral loads Seismic design philosophy, Equivalent lateral force procedure, dynamic analysis procedure.

8 Hours

UNIT - 6

Step by step procedure for seismic analysis of RC buildings (maximum of 4 storeys), Equivalent static lateral force method, response spectrum methods (without infills)

7 Hours

UNIT - 7

Earthquake resistant design of RC buildings – Preliminary data, loading data, analysis of subframes,load combinations, design of subframes (maximum of 4 storeys).

7 Hours

UNIT - 8

Earthquake resistant design of masonry buildings - elastic properties of structural masonry, lateral load analysis, Design of two storeyed masonry buildings.

6 Hours

TEXT BOOKS:

1. **Earthquake resistant design of structures** - Pankaj Agarwal, Manish Shrikande - PHI India.
2. **Earthquake Resistant Design of Structures** - S.K. Duggal - Oxford University Press, 2007.

REFERENCE BOOKS:

1. **Dynamics of Structures**- Clough and Penzien - (McGraw Hill book Co.).
2. **Geology with the Elements of Geomophology**- A.Y. Yakushova - (MIR Publisher, Moscow).
3. **Design of Earth Quake Resistant Structures**- Polyakov - (MIR Publisher, Moscow).
4. **Earth Quake Engineering Damage Assessment and Structural design**- S.F. Borg - (John Wiley and Sons. 1983).
5. **Earthquake Resistant Design**- Anil Chopra.

INDUSTRIAL WASTE WATER TREATMENT

Subject Code	**: 06CV835**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Difference between Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants. Stream Sampling, effluent and stream Standards and Legislation to Control Water Pollution.

5 Hours

UNIT - 2

Stream Quality, Dissolved oxygen Sag Curve in Stream, Streeter– Phelps formulation, Numerical Problems on DO prediction.

6 Hours

UNIT - 3

TREATMENT METHODS-I: Volume Reduction, Strength Reduction, Neutralization, Equalization and Proportioning.

5 Hours

UNIT - 4

TREATMENT METHODS-II: Removal of Inorganic suspended solids, Removal of Organic Solids, Removal of suspended solids and colloids. Treatment and Disposal of Sludge Solids.

6 Hours

PART - B

UNIT - 5

COMBINED TREATMENT: Feasibility of combined Treatment of Industrial Raw Waste with Domestic Waste, Discharge of Raw, Partially Treated and completely treated Wastes to Streams.

6 Hours

UNIT - 6

TREATMENT OF SELECTED INDUSTRIAL WASTE: Process flow sheet showing origin / sources of waste water, characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of waste disposal on water bodies

THE INDUSTRIES TO BE COVERED ARE:

1. Cotton Textile Industry

2. Tanning Industry
3. Cane Sugar Industry & Distillery Industry

10 Hours

UNIT - 7

TREATMENT OF SELECTED INDUSTRIAL WASTE-I:

1. Dairy Industry
2. Canning Industry
3. Steel and Cement Industry

7 Hours

UNIT - 8

TREATMENT OF SELECTED INDUSTRIAL WASTE-II:

1. Paper and Pulp Industry
2. Pharmaceutical Industry
3. Food Processing Industry

7 Hours

TEXT BOOKS:

1. **Industrial Waste Water Treatment**- Nelsol L. Nemerow.
2. **Industrial Waste Water Treatment**.- Rao MN, and Dutta A.K.
3. **Waste Water Treatment, Disposal and Reuse** - Metcalf and Eddy inc - Tata McGraw
4. Hill Publications, 2003.

REFERENCE BOOKS:

1. **Pollution Control Processes in industries-** Mahajan S.P.
2. IS Codes.

QUALITY MANAGEMENT SYSTEM IN CIVIL ENGINEERING

Subject Code	**: 06CV836**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

QUALITY MANAGEMENT SYSTEM - QMS: Introduction – Evolution of Quality Management System, Element of Quality, Quality Management System, Concept of Process, Network of Process in an organization, ISO 9000 Family, Applying ISO 9000 in practice, Importance of ISO 9000, Benefits of ISO standards of society, Total Quality Management,

Comparison of ISO 9000 and TQM – Quality related definitions – Leaders in Quality or Quality Gurus – Customer Orientation – Mahatma Gandhi.

5 Hours

UNIT - 2

IMPLEMENTING ISO 9001-2000 QUALITY MANAGEMENT SYSTEM: ISO 9000 – Quality Management Principles, ISO 9000 Documents Content of ISO 9001 : 2000, ISO 9001-2000 Quality Management System Requirements, General Requirements, Documentation Requirements, Management Responsibilities, Resource Management, Product Realization, Measurement, analysis and Improvement Monitoring and Measurement, Non-conforming Product, Analysis of data, Improvement, Implementing ISO 9001-2000 Quality Management System.

5 Hours

UNIT - 3

PREPARING A ISO 9001-200 QUALITY MANAGEMENT SYSTEM FOR CIVIL ENGINEERING: Quality Manual, Introduction, Scope of the Quality Manual, Applicability, Responsibility, Quality Management System, General Requirements, Management Responsibilities, Management Commitment, Customer Focus, Indian Construction Company Quality Policy, Planning Responsibility, Authority and Communication, Management Review, Resource Management, Provision of Resources, Human Resources Product Realization, Planning or Product Realization, Customer Related Processes, Design and Development, Purchasing, Production and Service Provision, Control of Monitoring and Measuring Devices Measurement, analysis and Improvement, Monitoring and Measurement, Non-conforming product, Analysis of data, Improvement

8 Hours

UNIT - 4

QUALITY MANAGEMENT SYSTEM PROCEDURES: Introduction, procedure for management review, Format for writing procedures, procedure for preparing Quality plans/ work instructions, Contract review, Design control, Document and data control, Document numbering system, Change request, procedure for purchasing, procedure for control of customer supplied product, procedure for product identification and traceability, procedure for process control, procedure for inspection and testing, procedure for control of inspection, measuring and test equipments, procedure for inspection and test status, procedure for the control of non-conforming product, procedure for corrective and preventive action, procedure for handling, storage, packaging and delivery, control of quality records, procedure for internal quality audits.

8 Hours

PART - B

UNIT - 5

WORK INSTRUCTIONS: Introduction – Document and Data Control, Material Procurement, Material Handling, Tendering and Estimating, Planning, Design, Training, Plant and Equipment, Bar Bending Schedule, Concrete Works, Earthworks and Compaction, General Soil Investigation works, Survey works, Concrete Repair Works, Road Works, Painting Works, Water Proofing works, Drainage Works, Quality Assurance and Control, Patching and Transportation of Concrete.

5 Hours

UNIT - 6

METHOD STATEMENT: Introduction, Concrete Works, Earthworks and Compaction, General Soil Investigation works, Survey works, Concrete Repair works, Concrete Demolition works, Road Works, Fencing works etc.

5 Hours

UNIT - 7

1. **JOB DESCRIPTION:** Introduction, Job Description of : Managing Director, Project Manager, Site Manager, Site Engineer, QA/QC Engineer, Foreman, Typist/Clerk, Design Engineer, Planning Engineer.

2. **QUALITY CONTROL PLAN/INSPECTION AND TEST PLANS (ITPS):** Introduction-Preparation of Project Quality Plans, Inspection and Test plant.

8 Hours

UNIT - 8

QUALITY RECORD/FORMATS: Preparation of Standard Formats: Revision Control form, Document Distribution List, Document Master List, Non-Conformance Report, Store Issue/Receipt Voucher, Local Purchase Order, Material Stock Card, Audit Notification, Quality Audit Report, Corrective Action Report, Calibration Record, Calibration Master Sheet, Work Instruction, Job Description, Contract/Tender Review Form, Quantity Survey Estimation/Take off sheet, Material/Plant Requisition, Drawing Schedule, Bar-bending Schedule, Design Calculation Sheet, Request for Inspection, Concrete Inspection Request, Inspection Check List – Drainage, Painting, Request for Inspection-Concrete Repair, Accident Report Form, Concrete Production, Concrete Compressive Strength Test Results, Request to Conduct Cube Test, Quality Awareness Training Record.

8 Hours

REFERENCE BOOKS:

1. **Quality Management System in Civil Engineering** - D.S. Rajendra Prasad - ISO 9001-2000, Sapna Book House, Bangalore.
2. **Productivity and Quality Improvement** - John L. Hardesky - McGraw Hill Book Company.

3. **ISO 9000 Concepts, Methods, Implementation-** Bagchi - Wheeler Publishing.
4. **Training Manual on ISO 9000-2000 and TQM**- Girdhar J. Gyani - Raj Publishing House.
5. **Documenting Quality for ISO 9000 and other Industry Standards -** Gary E. MacLean -Tata McGraw Hill Publishing Company Limited.
6. **Total Quality Management for Engineers** - Mohamed Zairi - Aditya Books Private Limited.
7. **Data Book for Civil Engineers Field Practice** - Elwyn E. Seelye - John Wiley & Sons, Inc.
8. **Properties of Concrete** - A.M. Neville - ELBS Publications.
9. IS : 456-2000 : Indian Standard Specifications for Plain and Reinforced Concrete Code of Practice : 4th Revision, Bureau of Indian Standards.
10. IS : 383-1990 : Indian Standard Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete : Bureau of Indian Standards.
11. **Quality Management -** Kanishka Bedi -(Oxford university press).

FINITE ELEMENT ANALYSIS

Subject Code	**: 06CV841**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Basic Concepts, Background Review: Theory of Elasticity, Matrix displacement formulation, Energy concepts, Equilibrium and energy methods for analyzing structures.

6 Hours

UNIT - 2

Raleigh **-** Ritz Method, Galerkin's Method, Simple applications in structural analysis.

8 Hours

UNIT - 3

FUNDAMENTALS OF FINITE ELEMENT METHOD: Displacement function and natural coordinates, construction of displacement functions for 2 D truss and beam elements.

5 Hours

UNIT - 4

Applications of FEM for the analysis of fine truss, continuous beam and simple plane frame problems.

7 Hours

PART - B

UNIT - 5

ANALYSIS OF 2D CONTINUUM PROBLEMS: Elements and shape functions, Triangular, rectangular and quadrilateral elements, different types of elements, their characteristics and suitability for application.

7 Hours

UNIT - 6

Polynomial shape functions, Lagrange's and Hermitian polynomials, compatibility and convergence requirements of shape functions.

6 Hours

UNIT - 7

THEORY OF ISOPARAMETRIC ELEMENTS: Isoparametric, subparametric and super- parametric elements, characteristics of isoparametric quadrilateral elements.

7 Hours

UNIT - 8

FEM PROGRAM: Structure of computer program for FEM analysis, description of different modules, pre and post processing.

6 Hours

TEXT BOOKS:

1. **Finite Element Analysis – Theory and Programming**- Krishnamoorthy – Tata McGraw Hill Co. Ltd., New Delhi.
2. **Introduction to the Finite Element Method**- J.F. Abel and Desai. C.S. - Affiliated East West Press Pvt. Ltd., New Delhi.
3. **Finite Element Methods** - Debatis Deb - Prentice hall of India.
4. **A first course in the Finite Element Methods** - Daryl L. Logan :- Thomson India Edn.

REFERENCE BOOKS:

1. **Finite element analysis in engineering design**- Rajasekharan. S. - Wheeler Pulishers.
2. **Finite Element Procedures**- Bathe K.J. - PHI Pvt. Ltd., New Delhi.
3. **The Finite Element Method**- Zienkeiwicz. O.C. - Tata McGraw Hill Co. Ltd., New Delhi.
4. **Finite Element Analysis**- S.S. Bhavikatt, - New Age International Publishers, New Delhi.

REINFORCED EARTH STRUCTURES

Subject Code	**: 06CV842**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

BASIC COMPONENTS OF REINFORCED SOIL: Introduction, General, basic mechanism of reinforced earth. Soil or fill-matrics, reinforcement bars, Metallic strips, Metallic grids, Facing Elements, concrete panel facing etc.

06 Hours

UNIT- 2

REINFORCED EARTH CONSTRUCTIONS: Introduction, Historical background, Principles of reinforced earth, Effect of reinforcement of soil. Mechanism of reinforced earth, Anchors, Tiebacks, Economic advantage of reinforced earth structure over similar structures.

06 Hours

UNIT- 3

DESIGN OF REINFORCED EARTH STRUCTURE: Introduction, Internal and overall stability, Reinforced earth dams, slopes, Reinforced Earth foundation, typical design of retaining walls and embankments.

07 Hours

UNIT- 4

SOIL NAILING TECHNIQUES: Introduction, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, -construction sequence components of system, design aspects.

07 Hours

PART-B

UNIT- 5

GEOSYNTHETICS (PART – 1): Introduction and overview. Historical developments, Recent developments. Classification based on materials. Geosynthetics – geotextiles, geogrids, geomembranes, geocomposites, geonets and other products, geomats, geomeshes, geowebs etc.

06 Hours

UNIT- 6

GEOSYNTHETICS (PART – 2): Methods of manufacturing process. Raw materials – polypropylene (polyolefin), Polyethylene (Polyoefin), Polyester,

Polyvinyl chloride, Elastomers etc, Testing & Evaluation- Hydrodynamic sieving test, Permeability test, Transmissivity test, Geotextile-Soil Filtration test etc,.

07 Hours

UNIT- 7

FIBER REINFORCED SOIL: General, soil stabilization, reinforced soil, soil nailing, texsol, ply soil, comparison of ply soil with reinforced soil and soil nailing, types of fibers – synthetic fibers, natural fibers, plant roots, direction of placements.

07 Hours

UNIT- 8

APPLICATION OF REINFORCED EARTH: Introduction, General, Reinforcement, Drainage, Filtration, Seperation, Jacketing, Erosion control and Slope protection, Advantages & elimitations, Applications of soil nailing techniques.

06 Hours

TEXT BOOKS:

1. **Design with geosynthetics**- Koerner. R.M. - Prince Hall Publication, 1994.
2. **Construction and Geotechnical Engineering using synthetic fabrics**- Koerner. R.M. & Wesh, J.P.- Wiley Inter Science, New York, 1980.
3. **Engineering with Geosynthetics**- Venkattappa Rao, G., & Suryanarayana Raju., G. V.S. - Tata Mc Graw Hill publishing Company Limited., New Delhi.

REFERENCE BOOKS:

1. **Earth reinforcement and Soil structure**- Jones CJEP- Butterworths, London, 1996.
2. **Geotextile Hand Book**- Ingold, T.S. & Millar, K.S. - Thomas, Telford,
   London.
3. **Earth Reinforcement Practices** - Hidetoshi Octial, Shigenori Hayshi & Jen Otani -Vol. I, A.A. Balkema, Rotterdam, 1992.
4. **Ground Engineer's reference Book**- Bell F.G. - Butterworths, London, 1987.
5. **Reinforced Earth**- Ingold, T.S. - Thomas, Telford, London.

URBAN TRANSPORT PLANNING

Subject Code	**: 06CV843**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Scope of Urban transport planning – Inter dependency of land use and traffic – System Approach to urban planning.

6 Hours

UNIT - 2

STAGES IN URBAN TRANSPORT PLANNING: Trip generation – Trip production - Trip distribution – Modal split – Trip assignment.

6 Hours

UNIT - 3

URBAN TRANSPORT SURVEY - Definition of study area-Zoning-Types of Surveys – Inventory of transportation facilities – Expansion of data from sample.

8 Hours

UNIT - 4

TRIP GENERATION: Trip purpose – Factors governing trip generation and attraction – Category analysis – Problems on above

5 Hours

PART - B

UNIT - 5

TRIP DISTRIBUTION: Methods – Growth factors methods – Synthetic methods – Fractor and Furness method and problems on the above.

5 Hours

UNIT - 6

MODAL SPLIT: Factors affecting – characteristics of split – Model split in urban transport planning – problems on above

6 Hours

UNIT - 7

TRIP ASSIGNMENT: Assignment Techniques – Traffic fore casting – Land use transport models – Lowry Model – Garin Lowry model – Applications in India – (No problems on the above)

8 Hours

UNIT - 8

URBAN TRANSPORT PLANNING FOR SMALL AND MEDIUM CITIES: Introduction – Difficulties in transport planning – Recent Case Studies

8 Hours

TEXT BOOKS:

1. **Traffic Engineering and Transport Planning**- L.R. Kadiyali - Khanna Publishers.
2. **Principles of urban transport system planning** - B.G. Hutchinson - Scripta Book Co., Washington D.C. & McGraw Hill Book Co.
3. **Introduction to transportation engineering**- Jotin Kristey and Kentlal - PHI, New Delhi.

REFERENCE BOOKS:

1. **Urban Transport planning**- Black John - Croom Helm ltd, London.
2. **Urban and Regional models in geography and planning**- Hutchison B G - John Wiley and sons London.
3. **Entropy in urban and regional modeling**- Wilson A G - Pion ltd, London.

GEOGRAPHIC INFORMATION SYSTEM

Subject Code	**: 06CV844**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Geographic Information system concepts and spatial models. Introduction, Spatial information, temporal information, conceptual models of spatial information, representation of geographic information. GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

7 Hours

UNIT - 2

Computer Fundamentals of GIS and Data storage, Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection : Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.

8 Hours

UNIT - 3

GIS DATA MODELS AND STRUCTURES – Cartographic map model, Geo-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.

5 Hours

UNIT - 4

DIGITIZING EDITING AND STRUCTURING MAP DATA – Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.

5 Hours

PART - B

UNIT - 5

DATA QUALITY AND SOURCES OF ERROR – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS.

10 Hours

UNIT - 6

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, role based systems, network analysis, special interaction modeling, Virtual GIS.

6 Hours

UNIT - 7

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling.

6 Hours

UNIT - 8

Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

5 Hours

TEXT BOOKS:

1. **Principles of GIS** - Peter A Burrough Reachael A Mc. Donnel - (Oxford).
2. **The GIS Book** - George B. Korte, P.E. - 5th Edn., Thomson Learning.
3. **Remote sensing and image interpretation** - Lillesand - (John Wiley and Sons).
4. **Geographical Information system**: Bemhard Sen-Wiley publications.
5. **GIS and Computer cartography** - Christopher Jones - (Longman).

ADVANCED DESIGN OF STEEL STRUCTURES

Subject Code	**: 06CV845**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Basic principles of design, stress strain relationship for mild steel, evaluation of full plastic moment for mild steel beams, plastic hinges, shapes factors and plastic moment. Fixed, simply supported beams, effect of partial fixity, rectangular portal frames, gable Invariance of collapse load.

5 Hours

UNIT - 2

Statement of theorems with examples, application of principles of virtual work, partial and over collapse. Trial error method. Method of combined mechanisms, plastic moment distribution method and other methods of determining plastic collapse load. Estimation of deflection, factors affecting fully plastic moment.

7 Hours

UNIT - 3

Minimum weight theories. Application of theorems and methods of solution. Plastic analysis applied to the design of fixed and continuous beams, portal and gable frames.

8 Hours

UNIT - 4

Design of Built-up beams. Design of encased beams.

6 Hours

PART - B

UNIT - 5

Design of open web structures. Advantages, Design Methods, Design of beams.

7 Hours

UNIT - 6

Small moment resistant connections, large moment resistant connections, semi-rigid and behavior of semi-rigid connections, Beam line method, modified slope deflection method, modified moment distribution method.

8 Hours

UNIT - 7

Principal axes of section, Maximum stress due to Unsymmetrical bending, the Z-polygon, Deflection of beams under unsymmetrical bending, design of purlins subjected to unsymmetrical bending.

5 Hours

UNIT - 8

Tubular structures – Introduction, permissible stresses, tube columns and compression members, tube tension members. Design of members of tubular roof truss for given member forces and their combination joints in tubular trusses, design of tubular beams and purlins.

6 Hours

TEXT BOOKS:

1. **Plastic Analysis**- B.G. Neal.
2. **Introduction to Plastic Analysis of Steel Structures**- J.F. Banker and Heyman
3. **Plastic Analysis of steel structures**.- Beedle

REFERENCE BOOKS:

1. **Steel Structures Vol - 1 and 2**- J.F. Baker
2. **Design of Steel Structures**- Ramachandra.
3. **Design of Steel Structures**.- Arya and Ajmani
4. CMERI Design Hand Book for Open Web Structures, Durgapur.
5. SP-6 (6), IS : 800, Steel Table.

DESIGN OF HYDRAULIC STRUCTURES

Subject Code	**: 06CV846**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

CANAL DESIGN: Introduction. Cross Section of an irrigation channel. Schedule of area statistics and channel dimensions. Longitudinal section of a channel. Cross section of an unlined channel. Channel dimensions.

7 Hours

UNIT - 2

CROSS DRAINAGE WORKS: Introduction. Types of cross drainage works. Design considerations for cross drainage works. Fluming of canal :

mitra's hyperbolic transition formula. Design of protection works (hydraulic design only)

7 Hours

UNIT - 3

GRAVITY DAMS –I: Introduction. Causes of failure. Design principles. Principal and Shear Stresses. Elementary profile of a Gravity dam. Stability analysis by analytical methods.

8 Hours

UNIT - 4

GRAVITY DAMS –II: Joints in Gravity Dams. Keys and Water Stops. Temperature Control in Gravity Dams. Galleries in gravity dams. Construction of a gravity dam. Foundation grouting, Instrumentation for gravity dams.

6 Hours

PART -B

UNIT - 5

EARTH DAMS: Introduction. Causes of failure of Earth dam. Preliminary section of an earthen dam. Determination of phreatic line by Casagrande's method and analytical method. Stability of slope by sliding wedge method (without earthquake)

6 Hours

UNIT - 6

SPILLWAYS: Introduction. Components of a spillway. Ogee shaped spillway. Discharge computation for an ogee spillway. Down stream profile and up stream profile of the crest of an Ogee spillway.

6 Hours

UNIT - 7

CANAL FALLS: Introduction. Types of falls. Design of trapezoidal notch type fall. Design of a sarda type fall

. **6 Hours**

UNIT - 8

CANAL REGULATION WORKS: Introduction. Functions of a regulator. Design of a cross regulator and a head regulator. Devices for sediment control : silt-ejector and silt-excluder.

06 Hours

TEXT BOOKS:

1. **Irrigation, Water Power & Water Resources Engineering**- K. R. Arora - Standard Publication, New Delhi.
2. **Text Book of Irrigation Engineering and Hydraulics structures**- R.K. Sharma - Oxford & IBH Publishing Co. New Delhi.

REFERENCE BOOKS:

1. **Irrigation Engineering & Hydraulics Structures**- Santoshkumar Garg - Khanna Publishers, New Delhi.
2. **Irrigation, Water Resources & Water Power**- P.N. Modi- Standard Book House, New Delhi.

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 06CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

10 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5

EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6

Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

8 Hours

UNIT - 7

Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8

EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore).

6 Hours

TEXT BOOKS:

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.

REFERENCE BOOKS:

1. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
2. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

PROJECT WORK

Subject Code	**: 06CV85**	IA Marks	: 100
No. of Project Hours/Week	: 06	Exam Hours	: 03
		Exam Marks	: 100

The project report shall be presented in the following form.

1. Definition of the problem.
2. Exhaustive literature survey.
3. Analysis based on type of problem. (as given above)
4. Conclusions, scope for further work.
5. References.

The Project Report shall be submitted in the prescribed standard format (04 copies) to the HOD, after the certification of the concerned guide and HOD.

SEMINAR

Subject Code	**: 06CV86**	IA Marks	: 50
No. of Seminar Hours/Week	: 03	Exam Hours	: --

Seminar shall be presented in the department in presence of a committee (Batch of Teachers) constituted by HOD. The seminar marks are to be awarded by the committee. Students shall submit the seminar report in the prescribed standard format.

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