STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

VI SEMESTER DIPLOMA IN CIVIL ENGINEERING / CIVIL (RURAL) ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Contracts and Accounts	1615602	03	03	10	20	70	100	28	40	03
3.	Environment Engineering	1615603	03	03	10	20	70	100	28	40	03
4.	Design of Structures	1615604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1615605/ 1616605	02	03	10	20	70	100	28	40	02
	Elective For Civil Engineering										
	(i) Advanced Construction Techniques and Equipments (1615605 A)		(ii) Maintenance and Rehabilitation of Structures (1615605 B)		(iii) Architectural Practices and Interior Design (1615605 C)		(iv) Earthquake Resistant Design & Construction (1615605 D)				
	Elective For Civil (Rural) Engineering										
	(i) Micro Irrigation (1616605 A)		(ii) Maintenance and Rehabilitation of Structures (1615605 B)					(iii) Water shade Management (1616605 C)			
		Total :-	**14**			**350**		**500**			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal(A)	External(B)			
6.	Environment Engineering Lab	1615606	02	03	15	35	50	20	01
7.	Elective (Any One) Lab	1615607/ 1616607	02	03	15	35	50	20	01
Elective For Civil Engg.									
(i) Advanced Construction Techniques and Equipments Lab (1615607 A)		(ii) Maintenance and Rehabilitation of Structures Lab (1615607 B)		(iii) Architectural Practices and Interior Design Lab (1615607 C)		(iv) Earthquake Resistant Design & Construction Lab (1615607 D)			
Elective For Civil (Rural)Engg.									
(i) Micro Irrigation Lab (1616607 A)				(ii) Maintenance and Rehabilitation of Structures Lab (1615607 B)			(iii) Water shade Management Lab (1616607 C)		
Total :-	**04**						**100**		

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
8.	Contracts and Accounts -TW	1615608	02	07	18	25	10	01
9.	Design of Structures -TW	1615609	02	07	18	25	10	01
10.	Professional Practices-VI -TW	1625610	03	07	18	25	10	02
11.	Civil Engineering Project -TW	1615611	05	15	35	50	20	03
12.	Rural Engineering -TW	1615612	03	07	18	25	10	01
Total :-			**15**			**150**		
Total Periods per week Each of duration One Hour			**33**	Total Marks =		**750**		**24**

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS ; THEORY

	Name of the Topics	Hrs/week	Marks
Unit -1	**Overview Of Business** 1.1. Types of Business • Service • Manufacturing • Trade 2. Industrial sectors Introduction to • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.)	**02**	
Unit -2	**Management Process** 2.1 What is Management? • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management • Planning • Organizing • Directing • Controlling	**07**	
Unit – 3	**Organizational Management** 3.1 Organization :- • Definition • Steps in organization 3.2 Types of organization • Line • Line & staff • Functional • Project 3.3 Departmentation • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector	**07**	

Unit – 4	**Human Resource Management** 4.1 Personnel Management • Introduction • Definition • Functions 4.2 Staffing • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development • Types of training ➢ Induction ➢ Skill Enhancement 4.4 Leadership & Motivation • Maslow's Theory of Motivation 4.5 Safety Management • Causes of accident • Safety precautions 4.6 Introduction to – • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act	**08**	
Unit – 5	**Financial Management** 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts • Types of Budgets ➢ Production Budget (including Variance Report) ➢ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to – • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty	**08**	
Unit – 6	**Materials Management** 6.1. Inventory Management (No Numerical) • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity • Introduction & Graphical Representation 6.4 Purchase Procedure • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management • Introductory treatment to JIT / SAP / ERP	**08**	

Unit – 7	**Project Management** (No Numerical) 7.1 Project Management • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma	**08**	
	Total	**48**	

Text/ Reference Books:-

Titles of the Book	**Name of Authors**	**Name of the Publishe**
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing

CONTRACTS AND ACCOUNTS
(CIVIL ENGINEERING GROUP)

Subject Code	Theory						Credits
1615602	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	**PROCEDURE OF EXECUTION OF WORK BY P.W.D.** 1.1 ORGANIZATION OF P.W.D. FUNCTIONS OF THEIR PERSONNEL. 1.2 P.W.D. PROCEDURE OF INITIATING THE WORK, ADMINISTRATIVE APPROVAL, TECHNICAL SANCTION, BUDGET PROVISION. 1.3 METHODS USED IN P.W.D. FOR CARRYING OUT WORKS CONTRACT METHOD AND DEPARTMENTAL METHOD , RATE LIST METHOD , PIECE WORK METHOD , DAY'S WORK METHOD , DEPARTMENT METHOD (NMR AND CASUAL MUSTER ROLL.)	**08**	**10**
Unit -2	***Contract*** 2.1 DEFINITION OF CONTRACT, OBJECTS OF CONTRACT, REQUIREMENTS OF VALID CONTRACT 2.2 TYPES OF ENGINEERING CONTRACT - LUMP SUM CONTRACT, ITEM RATE CONTRACT, PERCENTAGE RATE CONTRACT, COST PLUS PERCENTAGE, COST PLUS FIXED FEE, COST PLUS VARIABLE PERCENTAGE AND COST PLUS VARIABLE FEE CONTRACT, LABOUR CONTRACT, DEMOLITION CONTRACT , FEE CONTRACT, TARGET CONTRACT, NEGOTIATED CONTRACT . 2.3 Class of contractor, Registration of contractor. 2.4 BOT PROJECT.	**12**	**16**
Unit – 3	***Tender & Tender Documents*** 3.1 DEFINITION OF TENDER, NECESSITY OF TENDER, TYPES-LOCAL AND GLOBAL. 3.2 TENDER NOTICE, POINTS TO BE INCLUDED WHILE DRAFTING TENDER NOTICE , DRAFTING OF TENDER NOTICE . 3.3 Meaning of terms: Earnest money, security deposit, validity period, right to reject one or all tenders, corrigendum to tender notice and its necessity. 3.4 TENDER DOCUMENTS – LIST, SCHEDULED A, SCHEDULE B, SCHEDULE C . 3.5 TERMS RELATED TO TENDER DOCUMENTS – CONTRACT CONDITIONS , TIME LIMIT , TIME EXTENSION, PENALTY , DEFECTIVE MATERIAL AND WORKMANSHIP , TERMINATION OF CONTRACT, SUSPENSION OF WORK, SUBLETTING OF CONTRACT, EXTRA ITEMS ,ESCALATION ,ARBITRATION ,PRICE VARIATION CLAUSE, DEFECT LIABILITY PERIOD, LIQUIDATED AND UNLIQUIDATED DAMAGES. 3.6 FILLING THE TENDER BY CONTRACTOR AND POINTS TO BE OBSERVED BY HIM . 3.7 PROCEDURE OF SUBMITTING FILLED IN TENDER DOCUMENT , PROCEDURE OF OPENING TENDER , COMPARATIVE STATEMENT , SCRUTINY OF TENDERS ,AWARD OF CONTRACT, ACCEPTANCE LETTER AND WORK ORDER. 3.8 UNBALANCED TENDER, RING FORMATION.	**12**	**16**
Unit – 4	**Accounts in P.W.D.** VARIOUS ACCOUNT FORMS AND THEIR USES-MEASUREMENT BOOKS ,NOMINAL MUSTER ROLL, IMPREST CASH , INDENT, INVOICE, BILLS, VOUCHERS, CASH BOOK, TEMPORARY ADVANCE.	**04**	**06**
Unit – 5	**Payment to Contractors** MODE OF PAYMENT TO THE CONTRACTOR- INTERIM PAYMENT AND ITS NECESSITY, ADVANCE PAYMENT, SECURED ADVANCE, ON ACCOUNT PAYMENT , FINAL PAYMENT , FIRST AND FINAL PAYMENT , RETENTION MONEY, REDUCED RATE PAYMENT, PETTY ADVANCE, MOBILIZATION ADVANCE .	**04**	**06**

Unit – 6	**SPECIFICATIONS** 6.1 NECESSITY AND IMPORTANCE OF SPECIFICATIONS OF AN ITEMS, POINTS TO BE OBSERVED IN FRAMING SPECIFICATIONS OF AN ITEM, TYPES OF SPECIFICATION –BRIEF AND DETAILED, STANDARD AND MANUFACTURERS SPECIFICATION. 6.2 PREPARING DETAILED SPECIFICATIONS OF ITEMS IN CIVIL ENGINEERING WORKS. STANDARD SPECIFICATION BOOK. 6.3 LEGAL ASPECTS OF SPECIFICATION.	**08**	**10**
Unit – 7	**VALUATION** 7.1 DEFINITION, NECESSITY OF VALUATION. DEFINITIONS – COST PRICE, VALUE, DIFFERENCE BETWEEN THEM, CHARACTERISTICS OF VALUE, FACTORS AFFECTING VALUE. 7.2 TYPES OF VALUE: - BOOK VALUE, SCRAP VALUE, SALVAGE VALUE, SPECULATIVE VALUE , DISTRESS VALUE, MARKET VALUE, MONOPOLY VALUE, SENTIMENTAL VALUE, FACTORS AFFECTING VALUE . 7.3 DEPRECIATION, OBSOLESCENCE, SINKING FUND. METHODS OF CALCULATION OF DEPRECIATION – STRAIGHT LINE METHOD, SINKING FUND METHOD CONSTANT PERCENTAGE METHOD QUANTITY SURVEY METHOD. 7.1 COMPUTATION OF CAPITALIZED VALUE, GROSS INCOME, OUTGOING, NET INCOME, YEARS PURCHASE. TYPES OF OUTGOING AND THEIR PERCENTAGES. 7.2 VALUATION OF LANDS & BUILDINGS, FACTORS AFFECTING THEIR VALUATION, BOOK VALUE METHOD, REPLACEMENT VALUE METHOD AND COMPARISON METHOD. USE OF VALUATION TABLES .DEFERRED VALUE OF LAND. 7.3 FIXATION OF RENT AS PER PWD PRACTICE	**16**	**16**
	TOTAL	**64**	**80**

Text/Reference Books:-

Titles of the Book	**Name of Authors**	**Name of the Publisher**
ESTIMATING & COSTING IN CIVIL ENGINEERING	B.N. Datta	UBS Publishers
Estimating & costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti , Calcutta
Estimating & costing	S.C. Rangwala	Charotar Publication
Civil Engineering Contracts and accounts Vol I , II	B.S. Patil	Orient Longman,
ESTIMATING & COSTING	G. S. Birdie	Dhanpat Rai and Sons
Contracts and Accounts	S.P. Khattar	Foundation Publishing

ENVIRONMENTAL ENGINEERING
(CIVIL ENGG. GROUP)

Subject Code	Theory						Credits
1615603	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	**ENVIRONMENTAL POLLUTION AND CONTROL** 1.1 Introduction Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.	02	02
Unit -2	**PUBLIC WATER SUPPLY** 2.1 Quantity of Water Demands of water: Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand ; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, Design period for water supply scheme. Estimation of quantity of water supply required for a town or city, Types of water supply schemes. 2.2 Sources of Water Surface and Subsurface sources of water, Intake Structures- Definition and types, Factors governing the location of an intake structure, Water conservation, Ground water recharging – Necessity Importance and advantages. 2.3 Quality of Water Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN, Sampling of water, Water quality standards as per I.S. 2.4 Purification of Water Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Filtration-theory of filtration, classification of filters : slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter, Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test, Miscellaneous water Treatments (Water softening, Defluoridation techniques), Advanced Water Treatments (Electrolysis, Reverse Osmosis) , Flow diagram of water treatment plants, Low cost water Treatments: Necessity and importance in rural areas, Prevention of pollution of bores and bore wells.	18	24

	2.5 Conveyance and Distribution of Water :Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. Methods of distribution of water- Gravity, pumping, and combined system Service reservoirs – functions and types , Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system ; their suitability, advantages and disadvantages.		
Unit – 3	**DOMESTIC SEWAGE** 3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage 3.2 Building Sanitation Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe , Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing – one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan) , inspection and junction chambers, their necessity, location , size and shape. Maintenance of sanitary units. 3.3 Systems of Sewerage Types of Sewers, Systems of Sewerage, Design of sewers, self cleansing velocity and non scouring velocity Laying, Testing and maintenance of sewers. 3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts, ,location, spacing, construction details, Sewer Inlets , Street Inlets, Flushing Tanks – manual and automatic 3.5 Analysis of Sewage Characteristics of sewage, B.O.D./ C.O.D. and significance. , Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage 3.6 Treatment of Sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch.	**16**	**28**
Unit – 4	**INDU STRIAL WASTE** 4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments	**02**	**02**
Unit – 5	**ENVI RONMENTAL POLLUTION** 5.1 Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Sources , Effects and Control of Noise Pollution (only brief idea) Global warming, Acid Rain	**02**	**02**

Unit – 6	**SOLID WASTES FROM THE SOCIETY** 6.1 **Solid Waste Management** Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste. 6.3 **Hazardous Wastes** Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.	**04**	**05**
Unit – 7	**ENVIRONMENTAL SANITATION** 7.1 Environmental Sanitation Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working Composting (Nadep or Vermiculture), *7.2 Emerging Trends (only brief idea)* ant Gadge Baba Swachhatha Abhiyan Low cost atrines Jalswarajya Scheme.	**03**	**05**
Unit – 8	**PLUMBING** 8.1 Sanitary Plumbing, Layout, Details of water supply arrangement for residential and public building Rainwater and sewage collection systems	**01**	**02**
	Total	**48**	**70**

Text / Reference Books:-

Titles of the Book	**Name of Authors**	**Name of the Publisher**
Environmental Engineering (Volume I & II)	Santosh kr. Garg	Khanna Publishers,
Environmental Engineering	Kamla A. & Kanth Rao D. L.	Tata McGraw Hill,
Water Supply and Sanitary Engineering	Birdie G. S. Birdie J. S.	Dhanpat Rai & Sons
Plumbing – Design and Practice	Deolalikar S. G.	Tata McGraw Hill,
Air Pollution	Rao M. N. Rao H. V. N.	Tata McGraw Hill,
Ground Water	H. M. Raghunath	New Age International
Industrial Water Treatment	Rao & Dutta	-------
Environment Engineering	Rahul Sinha	Foundation Publishing

DESIGN OF STRUCTURES
(CIVIL ENGINEERING GROUP)

Subject Code	Theory						Credits
1615604	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	**Working Stress Method & Prestressed Concrete** 1.1 Introduction to reinforced concrete, R.C. Sections their behavior, grades of concretesteel. Permissible stresses, Assumptions in W.S.M. 1.2 Equivalent bending stress distribution diagram for singly reinforced section, 1.3 Concept of prestressed concrete, externally and internally prestressed member. 1.4 Advantages and disadvantages of prestressed concrete. 1.5 Methods of prestressing, pretensioning and post tensioning. Losses in prestressing. (No numerical problems shall be asked in written examination on pre-stressed concrete.)	**05**	**07**
Unit -2	**Limit State Method** 2.1 Definition, types of limit states, partial safety factors for materials strength, characteristic strength , characteristic load, design load. Loading on structure as per I.S 875. 2.2 I.S. Specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchoring effective span for beam, & slab.	**03**	**05**
Unit – 3	**Analysis and Design of Singly Reinforced Sections (LSM)** 3.1 Limit State of collapse (Flexure), Assumptions, stress, Strain relationship for concrete and steel, neutral axis, Stress block diagram and Strain diagram for singly reinforced section. 3.2 Concept of under- reinforced, over-reinforced and balanced section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for balanced singly R.C. Section. 3.3 Simple numerical problems on determining design constants, moment of resistance and area of steel .	**07**	**10**
Unit – 4	**Analysis and Design of Doubly Reinforced Sections (LSM)** 4.1 General features, necessity of providing doubly reinforced section reinforcement limitations. 4.2 Analysis of doubly reinforced section, strain diagram, stress diagram, depth of neutral axis, moment of resistance of the section. 4.3 Simple numerical problems on finding moment of resistance and design of beam sections.	**06**	**08**

Unit – 5	**Shear, Bond and Development Length (LSM)** 5.1 Nominal Shear stress in R.C. Section, design shear strength of concrete, Maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, forms of shear reinforcement. 5.2 Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value for hooks 90° bend and 45° bend Standard Lapping of bars, check for development length. 5.3 Simple numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilevers beam and slab, check for development length.	**06**	**18**
Unit – 6	**Analysis and Design of T-Beam (LSM)** 6.1 General features, advantages, effective width of flange as per IS : 456-2000 code provisions. 6.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam Section with neutral axis lying within the flange 6.3 Design of T-beam for moment and shear for Neutral axis within or up to flange bottom. 6.4 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section with N. A. lies within or upto the bottom of flange shall be asked in written examination.)	**05**	**08**
Unit – 7	**Design of Slab (LSM)** 7.1 Design of simply supported one-way slabs for flexure check for deflection control, and shear. 7.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear. 7.3 Design of two-way simply supported slabs for flexure with corner free to lift. 7.4 Design of dog-legged staircase. 7.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab & two-way simply supported slab. (No problem on design of dog-legged staircase shall be asked in written examination.)	**09**	**14**
Unit – 8	**Design of Axially Loaded Column and Footing (LSM)** 8.1 Assumptions in limit state of collapse – compression 8.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties. 8.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied. 8.4 Types of footing, Design of isolated square footing for flexure and shear. 8.5 Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment and two way shear only.)	**07**	**10**
	Total	**48**	**80**

Titles of the Book	Name of Authors	Name of the Publisher
Limit State Theory & Design of Reinforced Concrete	Dr. V. L. Shah & Late Dr. S. R. Karve	Structures Publications
Fundamentals of Reinforced Concrete	N. C. Sinha & S. K. Roy	S. chand & Company,
Reinforced concrete Design (IS 456- 2000) Principles & Practice	N. Krishna Raju R. N. Pranesh	New Age International
Prestressed Concrete	N. Krishna Raju	--
Reinforced concrete Design	S.U.Pillai & Devdas Menon	Tata Mcgraw Hill.
Limit State Design of Reinforced Concrete	P. C. Varghase	Prentice Hall of India,
Design of Structures	B.P. Pandey	Foundation Publishing

ELECTIVE (ANY ONE) –(i) ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENTS (CIVIL ENGG.)

Subject Code	Theory						Credits
1615605A	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	**1.0 Advanced Construction Materials** **1.1 FIBERS AND PLASTICS.** Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers. Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material. **1.2 Artificial Timber** Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber. **1.3 Miscellaneous materials** Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.	02	08
Unit -2	**Advanced Concreting Methods** **2.1 Prestressed Concrete** Grades of Concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prerstressing. Precautions during prestressing of members. **2.2 Under water Concreting** Underwater concreting for bridge piers and bored pile construction. Tremy method of under water concreting. Procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required. **2.3 Ready Mix concrete** Necessity and use of Ready Mix Concrete. Production and equipments for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC. **2.4 Tremix Concreting method** Definition, application of vacuum dewatering concreting. Equipments used in tremix concreting. Procedure of vacuum dewatering concreting (Tremix). **2.5 Special Concretes** Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete. Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect, ratio and percentage of steel fibers on strength of concrete.	06	12

Unit – 3	**Advanced Construction Methods.** **3.1 Formwork** Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms. **3.2 Construction of Multistoried Buildings** Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures. **3.3 Prefabricated Construction** Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members. **3.4 Soil Reinforcing techniques** Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.	**08**	**14**
Unit – 4	**Hoisting and Conveying Equipments** **4.1 Hoisting Equipments** Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks. **4.2 Conveying Equipments** Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.	**04**	**08**
Unit – 5	**Earth Moving machinery** **5.1 Excavation Equipments** Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines. **5.2 Compacting Equipments** Use of rollers, Roller types- Plain rollers , Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.	**04**	**10**
Unit – 6	6.1 **Concreting Equipments** 6.2 **Concrete Mixers** Types of concrete mixers. Weigh batching equipments, Equipments for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators. Automatic concrete plants – layout, process and working. 6.3 **Stone Crushers** Types of stone crushers, capacities and working. Equipments for production of artificial sand.	**04**	**10**
Unit – 7	**7.1 Miscellaneous Equipments and Equipment management** **7.2 Miscellaneous Equipments** Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine. **7.3 Equipment Management** Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of equipments.	**04**	**06**
	Total	**32**	**68**

Text Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Construction Technology Vol. I to IV	R. Chudly	ELBS- Longman Group
Construction Planning equipment and methods	R.L. Peurifoy	McGraw-Hill Co. Ltd.
Construction Engineering and management	S. Seetharaman	Umesh Publication, New Delhi.
Construction management and Planning	B. Sengupta and Guha	Tata McGraw Hill
Concrete Technology(Third Edition)	M. L. Gambhir	Tata McGraw Hill
Materials of construction	R. C. Smith	McGraw-Hill Co. Ltd.
Building Technology and valuation	TTTI Madras	TTTI Madras
Construction Planning and Equipment	R. Satyanarayana and S. C. Saxena	Standard Publication New Delhi
Civil Engineering materials	TTTI Chandigarh	TTTI Chandigarh
Construction of structures and Management of Works	S. C. Rangawala	Charotar Publication
Construction Materials	D.N. Ghose	Tata McGraw-Hill
A to Z of Building Construction	Mantri Construction	Mantri Publication

Reference books :-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
PWD Handbooks for - Materials - Foundation - Construction equipments	Govt. of Maharashtra	Govt. of Maharashtra
Practical Civil Engineering Handbook	Khanna ublication	Khanna Publication
Advanced Construction Techniques and Equipments	R.K. Yadav	Foundation Publishing

ELECTIVE (ANY ONE) –(ii) MAINTENANCE & REHABILITATION OF STRUCTURES

(CIVIL ENGINEERING GROUP)

Subject Code 1615605B	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	**Introduction** 1.1 Necessity, operation, maintenance & repairs of structures 1.2 Classification of maintenance, 1.3 Rehabilitation (restoration), strengthening, retrofitting. 1.4 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.	**03**	**06**
Unit -2	**Causes & detection of damages**: 2.1 Causes of damages, damages due to earthquakes, fire hazards, flood, hazards, dilapidation, 2.2 List of basic equipments for investigation.	**02**	**08**
Unit – 3	**Materials for repairs:** 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, 3.2 Shot-creting 3.3 Mechanical anchors.	**02**	**06**
Unit -4	**Masonry walls:** 4.1 Damp walls, causes effects, remedies, eradication of efflorescence 4.2 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.	**03**	**07**
Unit -5	**Repairs to foundation:** 5.1 Remedies, types & processes of settlement, foundation sinking 5.2 Examination of existing foundation, strengthening of foundation.	**03**	**07**
Unit -6	**Water proofing:** 1.1 Leaking Basements & roofs	**02**	**03**
Unit -7	**Concept of repairs & strengthening of RCC structures:** 7.1 Concept of repairs of RCC structures 7.2 Physical examination of common defects, 7.3 Structural repairs & strengthening repairs by new developments.	**02**	**03**
Unit -8	**Damage due to fire:** 8.1 Fire resistance, effects of temp. of RCC, 8.2 Repairs to RCC structures damaged due to fire	**02**	**03**
Unit -9	**Advanced Damage detection techniques:** **9.1 Advanced damage detection techniques, non destructive testing.**	**03**	**05**
Unit -10	**Strengthening methods:** 10.1 Cantilevers, beams, slabs, walls, columns, foundation.	**04**	**09**
Unit -11	**Evaluation of strength, economic & age of building:** 11.1 Determination of approx. age of a building. 11.2 Determination of strength of structural member of old building. 11.3 Finding cost in use of a existing building.	**02**	**05**
Unit -12	**Maintenance of life lines:** 12.1 Maintenance of electric supply, water supply leaking pipe joints and sewerage systems, closed drains, sewers. 12.2Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways	**02**	**05**

Unit -13	**Estimates and tendering:** 13.1 Estimates of annual repairs, special repairs and maintenance work. 13.2 Preparation of tender	**02**	**03**
	Total	**32**	**70**

Text /Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Maintenance and Repairs of Buildings	P.K. Guha	New Central book Agencies
Maintenance Engineering For Civil Engineers	Nayak B. S.	Khanna Publication
Maintenance and Repairs of Buildings	Hutchin Son, BD	Newnes –Butterworth.
Building Failures – Diagnosis and Avoidance	Ransom W. H.	E and F. N. Span.
Maintenance and Rehabilitation of Structures	P.K. Goyal	Foundation Publishing

ELECTIVE (ANY ONE) –(iii) ARCHITECTURAL PRACTICES & INTERIOR DESIGN (CIVIL ENGINEERING)

Subject Code	Theory						Credits
1615605C	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Section A – Architectural Practice		Hrs/week	Marks
Unit -1	**Architectural Design:** 1.1 Review of principles of Architecture. 1.2 Site selection, climatic conditions, sun control, orientation of building & site. 1.3 Building by laws & its applications.	**02**	**05**
Unit -2	**Building Aesthetics:** 2.1 Feeling for aesthetics and utility, composition, unity, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern. 2.2 Character of Building.	**02**	**05**
Unit – 3	**Design of Projects**: 1.1 A case study of residential building. 1.2 A case study of public / commercial building. 1.3 Aspect of working drawing – plan, elevation section	**08**	**15**
Unit – 4	**Landscaping**: 4.1 Soft and Hard landscaping. 4.2 Basic Principle of landscaping. 4.3 Assessment of land. 4.4 Design procedure. 4.5 A case study of land scape for public/ commercial building campus.	**04**	**10**
	Total	**16**	**35**
Section – B: Interior Design		Hrs/week	Marks
Unit – 1	**Elements and principles of design**. 1.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern. 1.2 Importance of colour as art element. Various colour scheme.	**03**	**05**
Unit – 2	**Anthropometrics Data:** 2.1 Relation of human measurement to furniture and movement and to circulation patterns.	**01**	**05**
Unit – 3	**Interior Materials:** 3.1 Different interior materials, paneling, partitions, finishing materials, furniture. 3.2 False ceiling, flooring, paints.	**02**	**04**
Unit – 4	**Interior of Residential building:** 4.1 Use of space, circulation, standard size of furniture. 4.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.	**07**	**17**
Unit – 5	**Interior of small commercial building:** 7.1 Planning of interior for small commercial units such as offices, consulting chambers, shops etc. 7.2 Furniture details such as executive table, architectures table etc. used in commercial units.	**03**	**04**
	Total	**16**	**35**

Text/Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Building construction	M. G. Shah, C.M. Kale / S.Y. Patiki	Tata McGraw Hill
Time saver standard for interior design & space planning	Joseph De Chiara, Julins Panch, martin Zelnik	MC Graw Hill
The use of colours in interiors	Albert O. Halse	Mc Graw Hill
Nwtert – Architects	Bousmaha Baiche & Nicholes Walliman	Black Well Science
Architectural Practices and Interior Design	-	-

1. **IS/International codes** – National building codes.
2. **Journals / Periodicals**:
    1. Inside out side
    2. A + D Journal on architecture.
    3. Indian Architects and builders.
    4. Design & Interiors.
4. **Software**:
    1. Auto CAD
    2. 3 D Max.
    3. 3 D Home

ELECTIVE (ANY ONE) –(iv) EARTHQUAKE RESISTANT DESIGN & CONSTRUCTION (CIVIL ENGINEERING)

Subject Code 1615605D	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

S.No.	UNIT	Periods
01	The Earthquakes	(06)
02	Vibrations of Single Degree of freedom System	(20)
03	Vibration of Multiple Degrees of Freedom System	(08)
04	Earthquake Motion & Reponse	(06)
05	Aseismic Design of Structures	(20)
	Total :	**(60)**

UNIT: 01 – THE EARTHQUAKES		**[06]**
01.01	Earthquakes	
01.02	Epicentre, hypocentre and earthquake waves	
01.03	Measurement of Ground Motion	
01.04	Cause of Earthquake (Plate tectonic)	
01.05	Intensity and Isoseismals of an earthquake	
01.06	Magnitude and Energy of an earthquake	
01.07	Relationship of fault length, affected area and duration with magnitude	
01.08	Consequences of earthquakes	
01.09	Sesimic Zoning	
01.10	Risk Maps	
01.11	Strong Ground Motion Arrays	
UNIT 02 – VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEM :		**[20]**
02.01	Types of Vibrations	
02.02	Degrees of Freedom	
02.03	Spring action and damping	
02.04	Equation of motion of single degree of freedom	
02.05	Free Vibrations of Undamped systems having single degree of freedom	
02.06	Combination of stiffnesses	
02.07	Vibration of Damped System having single degree of freedom	
02.08	Dry Friction Damping	
02.09	Negative Damping	
02.10	Forced Vibration of a Undamped System	
02.11	Forced vibrations of a damped system	

02.12	Equivalent viscous damping	
02.13	Vibration isolation	
02.14	Vibration Measuring Instruments	
02.15	System subjected to transient forces	
UNIT: 03 – VIBRATION OF MULTIPLE DEGREES OF FREEDOM SYSTEMS:		**[08]**
03.01	Introduction	
03.02	Two Degrees of freedom	
03.03	Many degress of freedom	
03.04	Forced vibration – earthquake excitation	
UNIT: 04 – EARTHQUAKE MOTION AND RESPONSE:		**[06]**
04.01	Introduction	
04.02	Strong motion earthquakes	
04.03	Numerical method for spectra	
04.04	Elastic spectra	
04.05	Ground velocity and displacement	
04.06	Inelastic spectra	
UNIT: 05 – ASEISMIC DESIGN OF STRUCTURES:		**[20]**
05.01	Design data and philosophy of design	
05.02	Multistory Buildings(G+2) Design-Analysis Design	
05.03	Earthquake resistant construction of buildings	
05.04	Ductility provisions in reinforced concrete construction	
05.05	Base Isolation	
05.06	Capacity building Design and Pushover Analysis	
05.07	Retrofitting of Buildings	

Books Recommended:-

1.	Earthquake Resistant Design & Analysis		Jai Krishna.
2.	Dynamic of Structures		Mario Paz.
3.	Dynamic of Structures		A. K. Chopra.
4.	IS : 1893-2002; IS : 13920-1993; IS : 13828-1993, IS : 4326-1993		
5.	Theory of Structures		Farzard Naim.
6.	Dynamics of Structures		Claugh & Penzien.

ELECTIVE (ANY ONE) –(i) MICRO IRRIGATION

(CIVIL (RURAL) ENGINEERING)

Subject Code 1616605A	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	**Introduction**: 1.1 Definition of micro irrigation 1.2 Necessity of micro irrigation, 1.3 Advantages of micro irrigation system, 1.4 Difficulties in micro irrigation. 1.5 Comparison between micro irrigation and other methods of irrigation.	**02**	**04**
Unit -2	**Soil–Plant-Water-Relation:** 2.1 Soil moisture relation, Hygroscopic water, Field capacity water, Gravitational water, Field capacity, Permanent wilting point, Available moisture, Readily available moisture, Soil moisture deficiency, Equivalent moisture. 2.2 Definition of irrigation frequency. Estimating depth and frequency of irrigation on the basis of soil moisture regime concept, Simple problems. 2.3 Optimum utilization of irrigation water, Definition of irrigation efficiencies. 2.4 Evapotranspiraton and/or Consumptive use of water, Methods of finding evopotranspiration by Pan Evaporimeter and Modified Penman method . (No Problems) 2.5 Water audit , Concept of water audit , Necessity of water audit, Benefits of water audit,	**06**	**14**
Unit – 3	**Methods of Micro Irrigation:** 3.1 Sprinkler and Drip irrigation. 3.2 Benefits and limitations of sprinkler and drip irrigation systems. 3.3 Comparison between sprinkler irrigation and drip irrigation system. 3.4 Layout of sprinkler irrigation system and drip irrigation system.	**04**	**06**
Unit – 4	**Design of Sprinkler Irrigation System:** 4.1 Design of main, sub-main, lateral and sprinkler. 4.2 Types of sprinklers and selection 4.3 Design and selection of micro sprinkler Irrigation systems.	**08**	**18**
Unit – 5	**Design of Drip Irrigation System:** 5.1 Design of main, Submain, Lateral and Drippers 5.2 Types of drippers and selection 5.3 Design and selection of micro jet 5.4 Selection of Pumps 5.5 Installation and maintenance of drip irrigation system	**08**	**18**
Unit – 6	**Fertigation And Filtrations**: 6.1 Advantage and limitations of Fertigation 6.2 Methods for Fertilizer injection 6.3 Filtration – Particle size, Selection of filter, Filtration methods, Methods of cleaning filters. 6.4 Filters and their types.	**04**	**10**
	Total	**32**	**70**

Text/Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Irrigation Theory and Practice	A.M.Michael	Vikas Publisher House, New Delhi.
Sprinkler Irrigation	--	WALMI Aurangabad.
Drip Irrigation	--	WALMI Aurangabad .
Principle of Drip Irrigation	Dr.M.S.Mane, B.L.Ayare Dr.S.S.Magar	Jain Brothers New Delhi.
Sprinkler Irrigation	R.K.Sivanappan	Oxford & I B Publishing New Delhi.
Micro Irrigation	S.P. Jain	Foundation Publishing

ELECTIVE (ANY ONE) –(ii) MAINTENANCE & REHABILITATION OF STRUCTURES
(CIVIL ENGINEERING GROUP)

Subject Code	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
1615605B	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	**Introduction** 1.5 Necessity, operation, maintenance & repairs of structures 1.6 Classification of maintenance, 1.7 Rehabilitation (restoration), strengthening, retrofitting. 1.8 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.	**03**	**06**
Unit -2	**Causes & detection of damages**: 2.3 Causes of damages, damages due to earthquakes, fire hazards, flood, hazards, dilapidation, 2.4 List of basic equipments for investigation.	**02**	**08**
Unit – 3	**Materials for repairs:** 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, 3.4 Shot-creting 3.5 Mechanical anchors.	**02**	**06**
Unit -4	**Masonry walls:** 4.3 Damp walls, causes effects, remedies, eradication of efflorescence 4.4 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.	**03**	**07**
Unit -5	**Repairs to foundation:** 5.3 Remedies, types & processes of settlement, foundation sinking 5.4 Examination of existing foundation, strengthening of foundation.	**03**	**07**
Unit -6	**Water proofing:** 1.1 Leaking Basements & roofs	**02**	**03**
Unit -7	**Concept of repairs & strengthening of RCC structures:** 7.4 Concept of repairs of RCC structures 7.5 Physical examination of common defects, 7.6 Structural repairs & strengthening repairs by new developments.	**02**	**03**
Unit -8	**Damage due to fire:** 8.3 Fire resistance, effects of temp. of RCC, 8.4 Repairs to RCC structures damaged due to fire	**02**	**03**
Unit -9	**Advanced Damage detection techniques:** **9.1** Advanced damage detection techniques, non destructive testing.	**03**	**05**
Unit -10	**Strengthening methods:** 10.1 Cantilevers, beams, slabs, walls, columns, foundation.	**04**	**09**
Unit -11	**Evaluation of strength, economic & age of building:** 11.1 Determination of approx. age of a building. 11.2 Determination of strength of structural member of old building. 11.3 Finding cost in use of a existing building.	**02**	**05**
Unit -12	**Maintenance of life lines:** 12.1 Maintenance of electric supply, water supply leaking pipe joints and sewerage systems, closed drains, sewers. 12.2Maintenance of roads, road berms, side drain, maintenance of bridges, culverts causeways	**02**	**05**

Unit -13	**Estimates and tendering:** 13.3 Estimates of annual repairs, special repairs and maintenance work. 13.4 Preparation of tender	**02**	**03**
	Total	**32**	**70**

Text /Reference Books:-

Titles of the Book	**Name of Authors**	**Name of the Publisher**
Maintenance and Repairs of Buildings	P.K. Guha	New Central book Agencies
Maintenance Engineering For Civil Engineers	Nayak B. S.	Khanna Publication
Maintenance and Repairs of Buildings	Hutchin Son, BD	Newnes –Butterworth.
Building Failures – Diagnosis and Avoidance	Ransom W. H.	E and F. N. Span.
Maintenance and Rehabilitation of Structures	P.K. Goyal	Foundation Publishing

ELECTIVE (ANY ONE) –(iii) WATERSHED MANAGEMENT
(CIVIL (RURAL) ENGINEERING)

Subject Code	Theory						Credits
1616605C	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

Contents : Theory		Hrs/week	Marks
Unit -1	**Introduction:** 1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management 1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development 1.3 Causes and effects of degradation 1.4 Integrated multi disciplinary approach for watershed, steps in watershed management. 1.5 Ill effects of urbanisation on watershed management	**06**	**08**
Unit -2	**Soil and Water Conservation:** 2.1 Soil erosion- definition of erosion, problems of erosion, types of soil erosion. 2.2 Land classification for watershed management 2.3 Soil conservation, need of soil conservation, soil conservation technology. 2.4 Engineering measures for erosion control such as contour cultivation, contour bunding, graded bunding, bench terracing, trenching, construction of grade stabilisation structure, retention of detention reservoirs, agronomical measures (names only) 2.5 Contour bunds, design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund. 2.6 Graded bunding, design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding. 2.7 Bench terracing, types, design. 2.8 Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains. 2.9 Control of gullies and their reclamation for various land Use	**08**	**20**
Unit - 3	**Water Harvesting:** 3.1 Definition, need of rainwater harvesting, advantages of Rainwater harvesting,. Techniques of rainwater harvesting- roof water harvesting and surface water harvesting (definition) 3.2 Traditional methods of rainwater harvesting in deccan plateau-cheruva, kohli tank, phad, kere, the ramtek model and bhandaras (short description with neat sketch). 3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, recharge structures Recharge structures – pit, trench, dug well, hand pump,recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters 3.4 Reuse of domestic water	**08**	**18**

Unit – 4	**Water Harvesting Structures:** 4.1 Types of watershed structures- such as small weir, banchara, K.T. weir, percolation tank, jalbandh, farm pond and check dam. 4.2 Details of watershed structure with neat sketch.	**05**	**14**
Unit - 5	**Socio Economic Aspects:** .1 People's awareness, participation and response. .2 State and integrated approach. .3 Sustainable society for economical upliftment. .4 Economics.	**05**	**10**
	Total	**32**	**70**

Text /Reference Books:-

Titles of the Book	Name of Authors	Name of the Publisher
Watershed management	V. V. Dhruvanarayana G. Sastry, U. S. Patnaik	Indian Council for Agricultural Research, Krishi Anusandhan Bhawan, Pusa, New Delhi
Watershed management in India	J. V. S. Murty	Wiley Estern Ltd.
Watershed planning and management	Raj Vir Singh	Yash publishing House,
Field manual on watershed management	--	Central Research Institute For Dry Land Agriculture, Hydrabad- 500659
Watershed management	E. M. Tideman	Omega Scientific Publications, New Delhi
Watershed management	N. D. Mani	Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
Watershed management : practice, policies and coordination	Robert J. Reimold	BOSS International US ISBN0070522995
Watershed Management	K.P. Sinha	Foundation Publishing

ENVIRONMENT ENGINEERING LAB
(CIVIL ENGINEERING GROUP)

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
1615606	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

Contents : Practical

Skills to be developed:

Intellectual Skills:

1. Identify the method for testing of water.
2. Interpret the results.

Motor Skills:

1. Observe chemical reactions
2. Handle instruments carefully

List of Practical:

Water Supply Engineering:

1) To determine fluoride concentration in given water sample
2) To determine the turbidity of the given sample of water.
3) To determine residual chlorine in a given sample of water.
4) To determine suspended solids, dissolved solids, and total solids of water sample
5) To determine the dissolved oxygen in a sample of water.
6) To determine the optimum dose of coagulant in the given sample by jar test.

Sanitary Engineering:

1) To determine the dissolved Oxygen in a sample of waste water.
2) To determine B.O.D. of given sample of waste water.
3) To determine C.O.D. of given sample of waste water.
4) To determine suspended solids, dissolved solids and total solids of waste water sample.
5) Design the Septic Tank for the public building such as hostel or hospital. Draw Plan and Section of the same along with the drainage arrangement in soak pit.
6) To determine various pollutant levels in the atmosphere using Digital Air Volume Sampler.
   a) Energy generation plants from solid wastes.
   b) Energy generation plants from Gobar Gas.

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ELECTIVE (ANY ONE) –(i) ADVANCED CONSTRUCTION TECHNIQUES AND EQUIPMENTS LAB

(CIVIL ENGINEERING)

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
1615607A	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

Contents: Practical

Skills to be developed:

Intellectual Skills:

1. know the new materials of construction.
2. get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

List of Practical:

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

ELECTIVE (ANY ONE) –(ii) MAINTENNANCE AND REHABILITATION OF STRUCTURES LAB

(CIVIL ENGINEERING GROUP)

Subject Code	Practical						Credits
1615607B	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

S.No	Contents: Practical
1	• Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
2	• Finding the approximate. strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
3	• Prepare estimate of retrofitting of plumbing of a building.
4	• Determine approximate age and economics of an old house.
5	• Determine load carrying capacity of a slab, beam, column by using rebound hammer

ELECTIVE (ANY ONE) –(iii) ARCHITECTUREAL PRACTICES AND INTERIOR DESIGN LAB

(CIVIL ENGINEERING)

Subject Code 1615607C	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

1. Prepare working drawing – plans, elevation, sections, considering thickness of plastering with

   micro level details and with scale 1:50 of a given submission drawing.

2. Prepare innovative plans, elevations, sections, considering the thickness of plastering with micro details and working drawings for residential building with scale 1:50 special details of

   components (Minimum 3 components such as kitchen otter details, compound wall gate, grill, front door, windows, staircase etc.) with scale 1:20 / 1:15 with respect to No. 1

3. Design a landscape for any existing public building campus
4. Prepare interior plan for 2 BHK residential bunglow / flat.
5. Prepare interior plan of any one commercial unit such as office, bank, restaurant,

shop etc. Prepare a report of market survey for different materials required for interiors

ELECTIVE (ANY ONE) –(i) MICRO IRRIGATION LAB
(CIVIL(RURAL) ENGINEERING)

Subject Code	Practical						Credits
1616607A	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS : PRACTICAL

1	• Report writing on visit to farm with sprinkler irrigation system and preparing layout plan and neat-labeled sketches.
2	• Report writing on visit to farm with drip irrigation system and preparing layout plan and neat-labeled sketches.
3	• Design of sprinkler irrigation system for given farm with cost estimation.
4	• Design of drip irrigation system for a given fruit garden farm with cost estimation.

ELECTIVE (ANY ONE) –(ii) MAINTENANCE AND REHABILITATION OF STRUCTURES LAB

(CIVIL ENGINEERING GROUP)

Subject Code 1615607B	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

Contents : Practical

1	• Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
2	• Finding the approximate. strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
3	• Prepare estimate of retrofitting of plumbing of a building.
4	• Determine approximate age and economics of an old house.
5	• Determine load carrying capacity of a slab, beam, column by using rebound hammer

ELECTIVE (ANY ONE) –(iii) WATER SHADE MANAGEMENT LAB
(CIVIL(RURAL) ENGINEERING)

Subject Code	Practical						Credits
1616607C	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS :PRACTICAL

Practical should contain Mini project on any one of the following:

1. Rain Water Harvesting of a building.
2. Integrated water resource management of small area (e.g. college campus, small village etc.)
3. Preparation of complete water shed management plan for small area identified from top sheet
4. Case study of watershed management plan.

CONTRACTS AND ACCOUNTS -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615608	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

CONTENTS :TERM WORK

Term Work :-

1. COLLECTING OLD SET OF TENDER DOCUMENT AND WRITING A REPORT ON IT
2. COLLECTION OF TENDER NOTICES PUBLISHED IN NEWSPAPERS FOR VARIOUS ITEMS OF CIVIL ENGINEERING WORKS. (AT LEAST 5) WRITE SALIENT FEATURES OF THEM.
3. DRAFTING A TENDER NOTICES FOR CONSTRUCTION OF A CIVIL ENGINEERING WORK (W. B. M. ROAD, RESIDENTIAL BUILDING)
4. PREPARATION OF TENDER DOCUMENT FOR THE BUILDING. (DETAILED ESTIMATE PREPARED FOR R.C.C. BUILDING IN ESTIMATING AND COSTING SHALL BE USED)
5. COLLECTION OF VARIOUS ACCOUNT FORMS FROM PWD & WRITING REPORT ON IT
6. WRITING A REPORT ON STORE PROCEDURE AND ACCOUNT PROCEDURE OF PWD. FOR IT A GUEST LECTURE OF PWD OFFICIAL MAY BE ARRANGED.
7. WRITING DETAILED SPECIFICATIONS FOR ONE ITEM FROM EACH OF FOLLOWING :
   - A) BUILDING CONSTRUCTION SYSTEM.
   - B) IRRIGATION ENGINEERING SYSTEM.
   - C) TRANSPORTATION ENGINEERING SYSTEM.
   - D) ENVIRONMENT ENGINEERING SYSTEM.

DESIGN OF STRUCTURES -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615609	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

C

CONTENTS :TERM WORK

1. ANALYSE THE DATA FOR DESIGN.
2. Design component parts of building. **Motor Skills**:
1. Draw proportionate sketches.
2. Draw constructional details.

Term work shall consist of sketch book, design of R.C.C structural components.

Sketch book:

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution & strain distribution diagrams R.C.C. section/detailing of reinforcement in joints/members. Design of R.C.C. structural components by LSM.

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on *any five* of the following R.C.C. component members of a two - storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920

1. One-way simply supported slab.
2. Two-way simply supported slab.
3. Cantilever slab/chajja.
4. T-Beam.
5. Column and column footing.
6. Dog-legged staircase

I.S. Codes:

1. IS 456:2000 - Plain and Reinforced concrete code of Practice.
2. SP16- Design Aids for reinforced concrete to IS 456.
3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.
   Part 1 - Dead load
   Part 2 - Imposed (live) load
   Part 3 - Wind load
4. SP 24 - Explanatory Handbook on IS 456
5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressed concrete.
6. SP34 : 1987- Handbook on concrete reinforcement and Detailing.
7. IS 13920-1993 DUCTILE detailing of R. C. Building subjected to Scrims forces.

PROFESSIONAL PRACTICES VI - TW
(MECH.+CIVIL ENGINEERING GROUP)

Subject Code	Term Work						Credits
1625610	No. of Periods Per Week			Full Marks	:	25	02
	L	T	P/S	Internal	:	07	
	—	—	03	External	:	18	

CONTENTS :TERM WORK

		Hrs/week
Unit -1	Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (minimum 3 visits) Following are the suggested type of Industries/ Fields - i) Visit to RCC framed structure building for details of reinforcement. ii) Visit to water /sewage treatment plant. iii) Visit to works carried out under watershed development/micro irrigation scheme. iv) Visit to any structure undergoing rehabilitation/retrofitting.	**18**
Unit -2	The Guest Lecture/s from field/industry experts, professionals to be arranged (2 Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work. a) HRD and civil engineering projects. b) Project planning and execution of civil engineering projects. c) PWD system of accounts d) Contract Management e) RCC design and detailing	**14**
Unit – 3	Information Search ,data collection and writing a report on the topic a) Collection of data for valuation of old building b) Collection of details of BOT project under execution. c) Collection of Data and case study of failure of RCC structure. d) Collection of information on any topic from journal available in library.	**10**
Unit – 4	The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are - i) Role of civil engineer in disaster management. j) Scope of out sourcing of civil engineering services. k) Pollution control.	**10**
Unit – 5	Seminar Presentation The students should select a topic for **Seminar** based on recent developments in civil engineering field, emerging technology etc.	**12**
	Total	**64**

CIVIL ENGINEERING PROJECT -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615611	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	03
	L	T	P/S	Internal	:	15	
	—	—	05	External	:	35	

CONTENTS :TERM WORK

Project:

Skills to be developed:

Intellectual skills:

1) Decide and collect data for projects.
2) Read and interpret the drawing, data.
3) Design the components.
4) Apply the principles rules regulations and byelaws.

Motor skills:

1) Plan for different phases of a task.
2) Prepare drawings for project.
3) Use of computer for drawing, networking.

List of Projects:

Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students .The project can be selected from any four civil engineering system like Building construction system, transportation engineering system, irrigation engineering system. A topic for project can also be selected on recent development in civil engineering.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

LIST OF CIVIL ENGINEERNG PROJECTS:

1) K.T. Weir
2) Lift Irrigation scheme.
3) Micro irrigation –Drip/Sprinkler Irrigation.
4) Junction planning for city roads/planning for roads for congested area/parking Studies etc.

5) Water shed development of small catchments.

6) Rain water harvesting for domestic or public building.

7) Campus development.

8) Interior decoration.

9) Concrete mix design.

10) Bridge design.

11) NDT of any RCC building.

12) Solid waste management.

13) Hospital waste disposal.

14) Recycling of resources.

15) Manufacturing of Pre cast concrete products.

16) Prestressed concrete.

17) Non conventional sources of energy.

18) Concrete pipe manufacturing unit.

19) Advance construction techniques.

20) Transfer of technology to villages.

21) Planning and design for residential apartments/commercial complex.

22) Planning and design of water treatment plant for given data.

23) Planning and design of water supply scheme for given lay out.

24) Planning and design of sewage treatment plant for given data.

25) Planning and design of sanitary scheme for given lay out.

Any other similar project can be selected.

Term Work: Shall consist of ----Detailed project report in above format.

Learning Resources:

1) Civil Engineering Hand Books / Reference books.
2) Civil Engineering Magazines
3) Relevant IS / International codes.
4) PWD Handbooks / M.I.Manuals
5) Material / Machinery / Product Catalogue.

RURAL ENGINEERING -TW
(CIVIL ENGINEERING GROUP)

Subject Code	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
1615612	L	T	P/S	Internal	:	07	
	—	—	03	External	:	18	

CONTENTS :TERM WORK

Term work shall consist of reports on any six of the following assignments:

1.1 Socio Economic survey of village, to identify, the needs of village people

1.2 Visit to the Structures built under water shade management program (at least two structure)

1. Gabian structure
2. Underground Bandhara
3. Kolhapur type weir
4. Cement Plug, Contour Bunding Rain Water Harvesting

Prepare neat labeled sketches and report on the above visits.

2 Visit to a farmer's house

2.1 Profile of a farmer for case study

2.2 Measured drawing of existing farmers house

2.3 Preparation of modified plan with due suggestions with respect to water supply, sanitations, cattle shade, fodder shade, court yard, composting yard, bio/Gobar Gas plant.

3 Report writing on the following with neat labeled sketches (Minimum one)

3.1 Sprinkler Irrigation System, with capacity calculation, head and discharge calculation,
power calculation for pump, pressure calculation for pipe.

3.2. Drip Irrigation System with capacity calculation, head and discharge calculation, Power calculation for pump, pressure calculation for pipe

3.3 Layout of Lift Irrigation, with capacity calculation, head and discharge calculation, power calculation for pump, pressure and dia. Calculation for pipe.

4 Report writing on any one of the cottage industries related to civil engineering regarding demand, utility, advantages, effect on rural economy etc.

1 Brick Manufacturing
2 Cement Block manufacturing
3 Cement concrete pole for fencing
4 Roof tiles / decorative Terracotta tiles manufacturing.
5 Stone Crusher.

5 Collecting information regarding schemes declared by State / Central Govt. in which Civil Engineer has effective participation (at least one)

1. Indira Awas Yojna
2. Walmiki Awas Yojna
3. Swajal Dhara Yojna
4. Jawahar Well Yojna
5. Village / Farm Tank.

6 Collecting information regarding use of non-conventional energy source like- Solar energy, Bio/Gobar Gas plant, wind mill,

7 A Study report on any one

1) Basic Study of electrical installation for house wiring, its components, different types of wires and its uses, need of fuse and its material used, need of earthling and its use.
2) Identification of electrical motor pump set, its electrical connection, fault finding and its remedies.

8 A Study report on

Concept of Community Polytechnic in India regarding their role in upliftment of rural population, their area of working, such as manpower development, transfer of technology, technical support services, information dissemination, community services. A visit to nearest Community Polytechnic shall be arranged. A visit report shall be prepared covering all aspect.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

VI SEMESTER DIPLOMA IN COMPUTER SCIENCE & ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	System Software	1618602	03	03	10	20	70	100	28	40	03
3.	Visual Basic	1618603	04	03	10	20	70	100	28	40	03
4.	Computer Graphics	1618604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1618605	04	03	10	20	70	100	28	40	03
	Elective - (i) Artificial Intelligence & Expert System (1618605A)					(ii) E-Commerce (1618605B)			(iii) Multimedia (1618605C)		
	Total:- 17						**350**	**500**			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Visual Basic Lab	1618606	06	03	15	35	50	20	03
Total:- 06							**50**		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	
7.	Computer Graphics -TW	1618607	04	15	35	50	20	02
8.	Elective (Any One) - TW	1618608	06	15	35	50	20	02
	Elective- (i) Artificial Intelligence & Expert System (1618608A) - TW				(ii) E-Commerce (1618608B) -TW		(iii) Multimedia (1618608 C) -TW	
9.	Project Work & Its Presentation in Seminar -TW	1618609	-	30	70	100	40	02
Total:- 10						**200**		
Total Periods per week Each of duration One Hours **= 33**						**Total Marks = 750**		**24**