

***Faculty of Engineering & Technology***

***P.K.University***

***Shivpuri (MP)***



**Evaluation Scheme & Syllabus for  
Department of Civil Engineering**

**Diploma-(Civil Engg.)**

**(I to VI Semester)**

**(Effective from session 2019-20)**

## EVALUATION SCHEME

Diploma – Civil Engineering Semester-I						
SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-101	Foundation Communication	30	70	25	25	150
DCE-102	Applied Mathematics-I	30	70	NA	NA	100
DCE-103	Applied Physics-I	30	70	25	25	150
DCE-104	Applied Chemistry	30	70	25	25	150
DCE-105	Engg. Drawing	30	70	NA	NA	100
Semester-II						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-201	Applied Mathematics-II	30	70	NA	NA	100
DCE-202	Applied Physics-II	30	70	25	25	150
DCE-203	Applied Mechanics	30	70	25	25	150
DCE-204	Building Material	30	70	25	25	150
DCE-205	Introduction To Computer (Practical)	NA	NA	25	25	50

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**DCE-101 FOUNDATIONAL COMMUNICATION**  
**SECTION "A" (ENGLISH)**

**1. PARTS OF SPEECH :**

- a. Noun
- b. The pronoun : Kinds and Usage
- c. The adjective : Kinds and Degree
- d. Determiner : Articles
- e. The verb : Kinds
- f. The Adverb : Kinds, Degree and Usage
- g. Prepositions
- h. Conjunctions
- i. The Interjections
- j. Subject: Verb Agreement (Concord)

**2. VOCABULARY BUILDING :**

- a. Antonyms and Synonyms
- b. Homophones
- c. One word substitutions
- d. Idioms and Phrases
- e. Abbreviations

**3. Grammar**

- a. Sentence & its types
- a. Tenses
- b. Punctuations
- c. Active and Passive voice
- d. Transformation of Sentences
- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

**4. DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing

**SECTION "B" (Hindi)**

5- संज्ञा, सर्वनाम, विशेषण, क्रियाविषेण, वर्णसमास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।

6- पत्र लेखन, निविदा संविदा, दर आमंत्रण (कोटेशन) अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदन लेखन, प्रेस विज्ञप्ति।

7- वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थीशब्द, शब्दयुग्म या समुच्चारित शब्दसमूह, वाक्य शुद्ध (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

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**DCE102 APPLIED MATHEMATICS I**

**1. ALGEBRA-I:**

- 1.1 Series : AP and GP; Sum, nth term, Mean
- 1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
- 1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule

**2. ALGEBRA-II:**

- 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
- 2.2 Complex number : Complex numbers, Representation, Modulus and amplitude Demoisre theorem, its application in solving algebraic equations, Mod. function and its properties..

**3. TRIGONOMETRY :**

- 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.
- 3.2 Inverse circular functions : Simple case only

**4. DIFFERENTIAL CALCULUS - I :**

- 4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
- 4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

**5. DIFFERENTIAL CALCULUS -II :**

- 5.1 Higher order derivatives, Leibnitz theorem.
- 5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
- 5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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**DCE-103 APPLIED PHYSICS-I**

**1. UNITS AND DIMENSIONS (4 MARKS)**

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to: (i) Checking the correctness of physical equations, (ii) Deriving relations among various physical quantities, (iii) Conversion of numerical values of physical quantities From one system of units into another. Limitations of dimensional analysis.

**2. ERRORS AND MEASUREMENT (4 Marks)**

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement(Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

**3. CIRCULAR MOTION (5 MARKS)**

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

**4. MOTION OF PLANETS AND SATELLITES :(5 Marks)**

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kapler's Law, Escape and orbital velocity, Time period of satellite, Geo- stationary, Polar satellites.

**DYNAMICS OF RIGID BODY (ROTATIONAL MOTION) (6 MARKS)**

Rigid body, Rotational motion, Moment of inertia, Theorems(Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindrical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane . Concept of Fly wheel.

**6. FLUID MECHANICS :(5 MARKS)**

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ( $A_1V_1=A_2V_2$ ), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

**7. FRICTION :(4 MARKS)**

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

**8. HARMONIC MOTION (6 MARKS)**

Periodic Motion , characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

**9. HEAT & THERMODYNAMICS: (6 MARKS)**

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

**10. ACOUSTICS (5 MARKS)**

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

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**DCE-104 APPLIED CHEMISTRY**

1. **ATOMIC STRUCTURE** : Basic concept of atomic structure, Matter wave concept, Quantum number, Haiseinberg's Uncertainty Principle, Shaples of orbitals.
2. **CHEMICAL BONDING** :Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.
3. **CLASSIFICATION OF ELEMENTS** :Modern classification of elements (s,p,d and f blocok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.
4. **ELECTRO CHEMISTRY-I**:Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,
5. **ELECTRO CHEMISTRY-II**:Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.
6. **CHEMICAL KINETICS** :Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.
7. **CATALYSIS** :Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.
8. **SOLID STATE** :Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.
9. **FUELS** :Definition, its classification, high & low Calorific value.Determination of calorific value of solid and liquid fuels by Bomb calorimeter. Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Disel and Petrol), Benzol and Power alchol. Knocking, Anti-knocking agents, Octane number and Cetane number.Cracking and its type, Gasoling from hydrogenation of coal (Bergius process and Fischer tropsch's process)Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.Numerical Problems based on topics
10. **WATER TREATMENT** :Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process).

Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foarming in biolers. Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. **COLLOIDAL STATE OF MATTER** : Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electro dialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. **LUBRICANTS** : Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. **HYDROCARBONS:**

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. **ORGANIC REACTIONS & MECHANISM:**

1. Fundamental auspects -A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion

B. Inductive effect, Mesomeric effect, Electromeric effect.

2 .A. Mechanism of addition reaction (Markonicove's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophillic) hydrolysis of alkyle halide, electrophillic substitution halogenation, Sulphonation, Niration and friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.

15. **POLYMERS**

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms) 2. Thermosetting and Thermoplastic resen -

A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application :

Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)

16. **SYNETHETIC MATERIALS :**

A. Introduction - Fats and Oils

B. Saponification of fats and oils , Manufacturing of soap.

C. Synthetic detergents, types of detergents and its manufacturing.

3. **EXPLOSIVES:** TNT, RDX, Dynamite.

4. Paint and Varnish



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**DCE-104 APPLIED CHEMISTRY LAB**

**LIST OF PRACTICALS**

1. To analyse inorganic mixture for two acid and basic radicals from following radicals

A. Basic Radicals :

NH<sub>4</sub><sup>+</sup>, Pb<sup>++</sup>, Cu<sup>++</sup>, Bi<sup>+++</sup>, Cd<sup>++</sup>, As<sup>+++</sup>, Sb<sup>+++</sup>, Sn<sup>++</sup>, Al<sup>+++</sup>, Fe<sup>+++</sup>, Cr<sup>+++</sup>, Mn<sup>++</sup>, Zn<sup>++</sup> ,  
Co<sup>+</sup> Ni<sup>++</sup>, Ba<sup>++</sup>, Sr<sup>++</sup>, Ca<sup>++</sup>, Mg<sup>++</sup>

B. Acid Radicals :

CO<sub>3</sub><sup>--</sup>, S<sup>--</sup>, SO<sub>3</sub><sup>--</sup>, CH<sub>3</sub>COO<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup> , Cl<sup>-</sup>, Br<sup>-</sup> , I<sup>-</sup> , So<sub>4</sub><sup>--</sup>

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.

3. To determine the total hardness of water sample in terms of CaCO<sub>3</sub> by EDTA titration method using Eriochroma black-T indicator.

4 To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.

5. To determine the Chloride content in supplied water sample by using Mohr's methods.

6. Determination of temporary hardness of water sample by O-Henry's method.

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**DCE-105 ENGINEERING DRAWING**

1. **Drawing, instruments and their uses.** **1 Sheet**
  - 1.1 Introduction to various drawing instruments.
  - 1.2 Correct use and care of Instruments.
  - 1.3 Sizes of drawing sheets and their layouts.
  
2. (a) **Lettering Techniques** **2 Sheet**

Printing of vertical and inclined, normal single stroke capital letter, Printing of vertical and inclined normal single stroke numbers. Stencils and their use.
- (b) **Introduction to Scales** **2 Sheet**

Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.
  
3. **Conventional Presentation :** **1 Sheet**

Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.
  
4. (a) **Principles of Projection** **1 Sheet**

Orthographic, Pictorial and perspective. Concept of horizontal and vertical planes. Difference between I and III angle projections. Dimensioning techniques.
- (b) **Projections of points, lines and planes.** **1 Sheet**
  
- 5 (a) **Orthographic Projections of Simple Geometrical Solids** **2 Sheet**

Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.
- (b) Orthographic views of simple composite solids from their isometric views.
- (c) Exercises on missing surfaces and views
  
6. **Section of Solids** **2 Sheet**

Concept of section in Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference plane And inclined to the others plane, true shape of the section
  
7. **Isometric Projection.** **2 Sheet**

Isometric scale and Isometric projection of solids.

8. **Free hand sketching** **1 Sheet**  
Use of squared paper Orthographic views of simple solids Isometric views of simple job like carpentry joints
9. **Development of Surfaces** **2Sheet**  
Parallel line and radial line methods of developments. Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).
10. **ORTHOGRAPHIC PROJECTION OF MACHINE PARTS:** **2 Sheet**  
Nut and Bolt, Locking device, Wall bracket
11. **PRACTICE ON AUTO CAD :** **2 Sheet**  
Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

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**DCE-201 APPLIED MATHEMATICS I**

**1. INTEGRAL CALCULUS - I:** Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

**2. INTEGRAL CALCULUS -II :**

- 2.1 Meaning and properties of definite integrals, Evaluation definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

**3. CO-ORDINATE GEOMETRY (2 DIMENSION):**

- 3.1 CIRCLE: Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.
- 3.2 Standard form and simple properties  
Parabola  $x^2=4ay, y^2= 4ax,$   
Ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$   
Hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

**4. CO-ORDINATE GEOMETRY (3 DIMENSION):**

- 4.1 Straight lines and planes in space - Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane ( Different Forms),
- 4.2 Sphere  $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$  (Radius, Centre and General Equation)

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**DCE-202 APPLIED PHYSICS-II**

**1. Optics :**

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroid's.

**2. Introduction To Fibre Optics :**

Critical angle, Total internal reflection, Principle of fiber optics, Optical fiber, Pulse dispersion in step-index fibers, Graded index fiber, Single mode fiber, Optical sensor.

**3. Lasers and its Applications :**

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

**4. Electrostatics :**

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor Energy of a charged capacitor, Effect of dielectric on capacitors.

**5. D.C. Circuits :**

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

**6. Magnetic Materials and Their Properties:**

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

**7. Semiconductor Physics :**

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

**8. Junction Diode and Transister :**

Majority and Minority charge carriers P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

**9. Introduction To Digital Electronics :**

Concept of binary numbers, Inter conversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

**10. Non-conventional energy sources:**

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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**DCE-202 APPLIED PHYSICS-II LAB**

**LIST OF EXPERIMENTS:-**

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph  $T^2$  versus  $l$  and using the formula  $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of -1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of  $E_1/E_2$  of cells by potentiometer.
8. Determination of specific resistance by Carry Foster Bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchhoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

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**DCE-203 APPLIED MECHANICS**

**1. Introduction:**

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

**2. (A). System of Forces :**

Concept of coplanar and non-coplanar forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplanar concurrent force system.

**(B). General Condition of Equilibrium:**

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

**3. Moment & couple:**

Concept of Varignon's theorem. Generalized theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

**4. Friction:**

Types of friction: statical, limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

**5. Machines:**

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

## **6. Centre of Gravity:**

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

## **7. Moment of Inertia:**

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

## **8. Beams & Trusses:**

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections.(simple problems only)

## **DCE-203 Applied Mechanics Lab : Practical's**

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss (King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and Efficiency of any three of the following machines:
  - (i) Simple wheel & axle
  - (ii) Differential wheel & axle
  - (iii) Differential pulley block
  - (iv) Simple Screw jack
  - (v) Simple Worm & worm wheel
  - (vi) System of Pulleys (any type).
9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina.



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**DCE 204- BUILDING MATERIALS**

**1. Building Stones:**

**Classification of rocks:** Geological and physical classification; Common rock forming minerals; Testing of stones for specific gravity, water absorption, durability, weathering, hardness by Moh's scale, of rocks.

**Quarrying:** Terminology used in quarrying; basic principles involved, methods of quarrying. Blasting: where used, principles of blasting, line of least resistance, drilling of holes (manually and mechanically), charging, tamping, firing, fuses & detonator, safety precautions, common explosives only names, their uses and storage. Wedging: where used, tools required and operation of wedging. Stone crushing: process & equipment used, crushers, grinding mills like hammer mill, ball mill & screens. Availability,

**Characteristics and uses of the following stones:**

Granite, sandstone, limestone, dolomite, slate, basalt, trap, quartzite and marble. Availability of different stones in state.

**2. Bricks and Clay Products:**

Raw materials for brick manufacture, properties of good brick making earth, field testing of brick clay. Manufacture of bricks: Preparation of clay-manually/mechanically. Moulding: hand molding and machine moldings. Drying of bricks. Burning of bricks. Clamps. Types of kilns, details of Bull's trench kiln and Hoffman's Kiln, process of burning, size of standard bricks. IS Classification of bricks as per IS: 1077 and testing of common building bricks as per IS: 3495 recommendations. Compressive strength, water absorption, efflorescence test; refractory bricks: composition, properties and uses. Building tiles: types- wall, ceiling, roofing and flooring tiles, their properties, and uses. Other clay products: earthenware and stoneware, their properties and uses.

**3. Lime**

Natural sources of lime. Definitions of quick lime, fat lime, hydraulic lime, hydrated lime, lump lime, calcinations, slaking, manufacture of lime. Process of setting and hardening action of lime. Field tests of lime as per IS 1624. Pozzolonic materials. Types, properties and uses.

**4. Cement**

Natural and artificial cement, raw material, manufacture of ordinary Portland cement, flow diagram for dry and wet process, setting and hardening of cement, types of cement, properties of cement test of cement as per IS.

**5. Timber and wood based Products:( Identification of different types of timber):**

Teak, chir, shisham, sal, mango,devdar, kail etc. Market forms of converted timber as per IS. Seasoning of timber: purpose, types of sea-soning, air seasoning, water seasoning, kiln seasoning, chemical seasoning, Solar seasoning kiln. Defects in timber. Decay in timber. Preservation of timber and methods of treatment. Properties of good timber. Common structural timbers in India,

their availability, and uses. Plywood, veneers; manufacture of plywood, uses of plywood. Other wood based product their brief description, manufacture and uses. Laminated boards: block boards, fiber boards, resistant board, hard board, plastic coated finishes, water & fire resistant plywood, PVC boards.

## **6. Paints**

Various types of paints. Constituents of oil paints, their functions and properties. Cement paints, their properties and uses, Varnish and polish: types, properties and uses. Lacquers and enamels: their properties and uses. Trade names of different products.

## **7. Insulating Materials**

Properties, uses and requirements of heat and sound insulating materials. Properties and uses of: cork, rock wool, glass wool, concrete, aluminum foil, asbestos sheets for ceiling, commercial names of different insulating materials.

## **8. Glass**

Types of glasses and their properties: Sheet glass, plate glass, frosted glass, wired glass, fiber glass bullet resisting glass, colored glass and glass wool Commercial sizes, forms and their uses.

## **9. Plastics**

Methods of moldings and types, properties and uses of plastics. Important commercial product, uses of plastic in Civil Engineering: plastic pipes, taps, valves, plastic coated paper, polythene sheets, Thermo Cole, Bakelite, PVC.

## **10. Water proofing materials.**

List of water proofing materials, suitable for use in D.P.C., Basement floor and walls, Toilet, Kitchen, Roof Terraces, Water tanks, etc. Properties & commercial trade names, approxy.

## **11. Exposure to non-conventional & waste by product**

Fly ash, Stone Cladding and other finishing materials, ACC bricks, Hollow concrete block, Eco friendly material, Fly ash bricks, Micro silica.

***Department Of Civil Engineering***  
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***P.K. University, Shivpuri (MP)***  
***I Year II Semester***  
**CIVIL LAB - I**  
**(Building Material Testing Lab)**

**LIST OF PRACTICALS:**

1. Identification of different types of stones and aggregates (visual identification).
2. Identification of timbers: teak, sal, chir, shisum, siras, deodar, kail and mango. (visual identification)
3. To conduct field tests of cement.
4. To determine normal consistency of cement.
5. To determine setting time (initial and final) of cement.
6. To determine fineness of given sample of cement.
7. To determine compressive strength of bricks.
8. To determine water absorption of bricks
9. To determine soundness of cement.
10. To identify hydraulic & fat lime.
11. To visit nearby bricks klin/Lime klin/ Cement Industry

## EVALUATION SCHEME

Diploma – Civil Engineering Semester-III						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-301	Functional Communication	30	70	25	25	150
DCE-302	Elementary Elect. & Mech. Engg.	30	70	NA	NA	100
DCE-303	Strength of Materials	30	70	25	25	150
DCE-304	Hydraulics	30	70	25	25	150
DCE-305	Public Health Engineering	30	70	25	25	150
DCE-306	Surveying - I	30	70	25	25	150
Diploma – Civil Engineering Semester-IV						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-401	Soil Mechanics & foundation Engg.	30	70	NA	NA	100
DCE-402	Building Construction & Maintenance Engg	30	70	NA	NA	100
DCE-403	Concrete Technology	30	70	NA	NA	100
DCE-404	Civil Engineering Drawing- I	30	70	NA	NA	100
DCE-405	Civil Lab - II	NA	NA	25	25	50

**Department of Civil Engineering**  
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**II Year III Semester**  
**DCE-301 Functional Communication**  
**Section “A” (English)**

Text Lessons

Unit I.	On Communication
Unit.II	Exploring Space
Unit.III	Sir C.V. Raman
Unit.IV	Professional Development of Technicians
Unit.V	Buying a Second Hand Bicycle
Unit.VI	Leadership and Supervision
Unit.VII	First Aid
Unit.VIII	The Romanance of Reading
Unit.IX	No Escape from Computers
Unit.X	Bureau of Indian Standards

**Section “B” Hindi**

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रान्ति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

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***II Year III Semester***

**DCE-302 ELEMENTRY ELECTRICAL AND MECHANICAL ENGG.**

**(A) Elements of Mechanical Engineering**

1. Construction and working of I.C. Engines, their classifications (2 stroke and 4 stroke), details of 4 stroke I.C. Engines.
2. Types of compressors and their uses
3. Different type of gears and their applications.
4. Conveyers, hoists and other material handling equipment's-their functioning and uses.
5. Different kinds of lathes, milling machines and drilling machines.
6. Different kinds of Jacks & Hammers and their uses.

**(B) Elements of Electrical Engineering**

1. **A.C. Machines-** Their types, uses and Physical & Electrical specification.
  - (a) Transformers
  - (b) Alternators
  - (c) Induction Motor
2. General idea of electrical measuring instruments like Ammeter Voltmeter, Wattmeter and Meggar and their uses.
3. Different types of lamps like incandescent lamps, sodium vapor lamp florescent tube. Halogen lamps - CFL, their merits, demerits and use.
4. Bye laws pertaining to electrical installations, Fans and AC's different types of artificial lighting systems, Lighting systems for residential buildings, public building, schools, colleges, hotels, hospital, exhibition hall, library etc.(IS)
5. Simple electrical circuits used in house wiring
6. Ear thing - need and procedure.
7. Safety against electrical shocks.

***Department of Civil Engineering***  
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***II Year III Semester***  
**DCE- 303 STRENGTH OF MATERIALS**

**1. Principal Stress and Principal Planes :**

Principal stress and principal plane under direct and shear stress. Graphical determination by Mohr's circle method.

**2. Bending Moment and Shear Force:**

Concept of a beam, and supports (Hinged, Roller and Fixed). Types of Beams: Simply supported, cantilever, fixed, overhang and continuous beams. Types of loads (distributed, point and varying). Concept of Bending Moment & Shear Force. Sign conventions. Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed, concentrated and uniformly varying loads. Relationship between load, shear force and bending moment. Point of maximum B.M. and contraflexure, concept of fixed and continuous beams.

**3. Bending and Shear Stresses**

Assumption of theory of simple bending. Derivation of the equation.  $M/I = F/Y = E/R$ . Concept of centroid and second moment of area, Radius of gyration, Theorems of parallel & perpendicular axes, Second Moment of area for sections: rectangle, triangle, circle, trapezium, angle, Tee, I, Channel and compound sections. Moment of resistance, section modulus and permissible bending stresses, Bending stresses in circular, rectangular, I, T and L section. Comparison of strength of the above sections. Concept of shear stresses in beams, Shear stress distribution in rectangular, I and T section.

**4. Combined Direct & Bending Stresses:**

Concentric and eccentric loads, eccentricity, effect of eccentric load on the section, middle third rule; stresses due to eccentric loads. Examples in the case of short columns, chimneys and dams.

**5. Slopes and Deflections of Beams:**

Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and deflection for the following standard cases by double integration or moment area method.

(1) Cantilever having point load at the free end. Cantilever having point load at any point of the span. Cantilever with uniformly distributed load over the entire span. Cantilever having U.D.L. over part of the span from free end. Cantilever having U.D.L. over a part of span from fixed end.

(2) Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span.

**6. Columns & Struts:** Definition of long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse Load, End conditions of column. Application of Euler's and Rankin's formula (no derivation), simple numerical problems based on Euler's and Rankin's formulae.

**7. Torsion** Definition of torque and angle of twist. Derivation of torsion equation. Polar moment of inertia. Strength of hollow and solid shaft, advantage of a hollow shaft over a solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse Power transmitted. Calculation of shaft diameter for a given Horse Power.

**8. Fixed and Continuous Beam:**Effect of fixing and continuity, fixed beams with point loads and U.D. Load. Continuous beam of uniform section covering three spans with free ends (supports being at the same level) B.M. & S.F. Diagram. Points of Contra flexure of fixed and continuous beams. Introduction of indeterminate and determinate structure (frame) and analysis of simple determinate frame .

### **DCE- 303 LABORATORY WORK**

1. Determination of shear force at different sections on a simply supported beam under points loads.
2. Determination of bending moment at different sections on a simply supported beam under different types of loading.
3. Determination of yield stress, ultimate stress, percentage elongation, plot the stress strain diagram and compute the value of Young's Modulus of mild steel.
4. Determination of the maximum deflection and Young's Modulus of elasticity by deflection apparatus.
5. Determination of modulus of rigidity of material by Torsion apparatus.
6. Determination of stiffness/deflection of a helical spring.
7. Determination of hardness of a metal plate by Rock Well, Brinell hardness testing machine.
8. To perform impact test on Izod Impact testing machine.



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***II Year III Semester***  
**DCE- 304 HYDRAULICS**

**1. Introduction:**

- 1.1 Fluid : Real fluid, ideal fluid.
- 1.2 Fluid Mechanics, Hydraulics, Hydrostatics, Hydrokinematics and Hydrodynamics.

**2. Properties of Fluids**

- 2.1 Mass density, specific weight, specific gravity, cohesion, adhesion, viscosity, surface tension, capillarity, vapor pressure and compressibility.

**3. Hydrostatic Pressure:**

- 3.1 Pressure, intensity of pressure, pressure head, Pascal's law and its applications.
- 3.2 Total pressure, resultant pressure, and centre of pressure.
- 3.3 Total pressure and centre of pressure on vertical and inclined plane surfaces:
  - 3.3.1 Rectangular
  - 3.3.2 Triangular
  - 3.3.3 Trapezoidal
  - 3.3.4 Circular

**4. Measurement of Pressure**

- 4.1 Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.
- 4.2 Piezometers, simple manometer, differential manometer and mechanical gauges. Measurement of pressure by manometers and pressure gauges.

**5. Fundamental of Fluid Flow**

- 5.1 Types of Flow:
  - 5.1.1 Steady and unsteady flow
  - 5.1.2 Laminar and turbulent flow
  - 5.1.3 Uniform and non-uniform flow.
- 5.2 Discharge and continuity equation (flow equation)
- 5.3 Types of hydraulic energy.
  - 5.3.1 Potential energy
  - 5.3.2 Kinetic energy
  - 5.3.3 Pressure energy
- 5.4 Bernoulli's theorem; statement and description (without proof of theorems).
- 5.5 Venturimeter (horizontal and inclined) and Orifice Plate meter.

**6. Orifice:**

- 6.1 Definition of Orifice, and types of Orifices,
- 6.2 Hydraulic Coefficients.

- 6.3 Large vertical orifices.
- 6.4 Free, drowned and partially drowned orifice.
- 6.5 Time of emptying a rectangular/circular tanks with flat bottom.

## **7. Flow through Pipes**

- 7.1 Definition, laminar and turbulent flow explained through Reynold's Experiment.
- 7.2 Reynolds Number, critical velocity and velocity distribution.
- 7.3 Head Losses in pipe lines due to friction, sudden expansion and sudden contraction entrance, exit, obstruction and change of direction
- 7.4 Hydraulic gradient line and total energy line.
- 7.5 Flow from one reservoir to another through long pipe of uniform and composite section.
- 7.6 Water Hammer Phenomenon and its effects. (only elementary treatment)

## **8. Flow through open channels.**

- 8.1 Definition of a channel, uniform flow and open channel flow .
- 8.2 Discharge through channels using
  - (i) Chezy's formula (no derivation)
  - (ii) Manning's formula
- 8.3 Most economical sections
  - (i) Rectangular
  - (ii) Trapezoidal

## **9. Flow Measurements**

- 9.1 Measurement of velocity by
  - (i) Pitot tube
  - (ii) Surface Float
  - (iii) Current-meter
  - (iv) Velocity rods.
- 9.2 Measurement of Discharge by a Notch
  - 9.2.1 Difference between notches and orifices.
  - 9.2.2 Discharge formulae for rectangular notch, triangular Notch, trapezoidal notch, and conditions for their use. (with derivation)
- 9.3 Measurement of discharge by weirs.
  - 9.3.1 Difference between notch, weir and barrage.
  - 9.3.2 Discharge formula for free, drowned, and broad crested weir with and without end contractions ; velocity of approach and condition of their use.
  - 9.3.3 Venturi flumes to measure flow.
- 9.4 Measurement of Discharge by velocity area-method.

## **10. HYDRAULIC MACHINE :**

- 10.1 Reciprocating pumps
- 10.2 Centrifugal pumps
- 10.3 Impulse Turbines
- 10.4 Reaction Turbines
- Sketching and description of principles of working of above mentioned machines

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***II Year III Semester***

**DCE- 304 HYDRAULICS**

**LABORATORY WORK**

- (i) To verify Bernoulli's Theorem.
- (ii) To find out venturimeter coefficient.
- (iii) To determine coefficient of velocity ( $C_v$ ), coefficient of discharge ( $C_d$ ) coefficient of contraction ( $C_c$ ) and verify the relation between them.
- (iv) To perform Reynold's Experiment.
- (v) To determine Darcy's coefficient of friction for flow through pipes.
- (vi) To verify loss of head due to: (a) Sudden enlargement (b) Sudden Contraction.
- (viii) To determine velocity of flow of an open channel by using a current meter.
- (ix) To determine coefficient of discharge of a rectangular notch/triangular notch.
- (x) Study of the following
  - (i) Reciprocating Pumps or Centrifugal Pumps.
  - (ii) Impulse turbine or Reaction turbine
  - (iii) Pressure Gauge/water meter/mechanical flow meter/ Pitot -tube.

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**II Year III Semester**

**DCE- 305 PUBLIC HEALTH ENGG.**

**(A) Water Supply Engg.**

**1. Introduction:** Necessity and brief description of water supply system. Water requirement: Per capita consumption for domestic, industrial, public and firefighting uses as per IS standards. Consumption, demand and its variation.

**2. Sources of Water:** Surface water sources : Rivers, canal, in ponding reservoir and lakes, their quality of water and suitability.

**3. Water Treatment:** Suspended, colloidal and dissolved impurities Physical, chemical and bacteriological tests and their significance. Minimum standards required for drinking water, Principles of Sedimentation, Coagulation, Flocculation, Filtration, Disinfection (Chlorination) including Jar Test, Break point chlorination, Residual chlorine. Flow diagram of different treatment units. Function, constructional details, working and operation of

(i) Aeration fountain (ii) Mixer (iii) Flocculator (iv) Clarifier (v) Slow and rapid sand filter (vii) Chlorination chamber (viii) Water softening (ix) Removal of Iron and Magnese. Chemicals required for water treatment, their uses ,and feeding devices. Simple design of sedimentation tank, and filters.

**4. Water Distribution**

**(i) Pipes:** Different types of Pipes: Cast iron, steel, plastic, (PVC, LDPE, HDPE), asbestos cement, concrete, plastic, GI and lead pipes. Details of their sizes, joints and uses.

**(ii) Appurtenances:** Sluice (Gate and spindle), air, reflux, scour and safety valves, fire hydrants, their working and uses.

**(iii) Distribution system:** Requirements of distribution: Minimum head and rate. Types of lay out- dead end, grid, radial and ring systems. System of water supply- intermittent and continuous. Service reservoirs- types, necessity and accessories.

**(iv) Storage:** Necessity, types of storing tanks: G.I. Sheet Tank, P.V.C. tank, over head tanks.

**5. Laying of Pipes:** Setting out alignment of pipe line Excavation in different types of soils and precautions taken. Precautions taken for traffic control, bedding for pipe line. handling, lowering, laying and jointing of pipes, testing of pipe lines and back filling. Use of boning rods.

**6. Building Water Supply**

(i) General layout of water supply arrangement for a building (single and multistoried) as per IS Code of practice. Water supply fixtures and their installation. Tapping of water mains.

(ii) Hot and Cold Water supply in buildings. Use of Solar water heaters.

(iii) Rural water supply: Sources, treatment and distribution.

**7. Maintenance:** Leakage detection and prevention. Replacement of damaged pipe. Maintenance of domestic plumbing fixtures.

## **(B) SANITARY ENGINEERING**

**8. Introduction:** Waste: Dry, semiliquid, liquid, Necessity of systematic collection and disposal of waste. Brief description of sewage disposal system. Conservancy and water carrying system, their advantages and disadvantages.

### **9. Quantity of Sewage:**

- (i) Sewage: Domestic, industrial and storm water.
- (ii) Volume of domestic sewage (DWF), variability of flow, limiting velocities in sewers.
- (iii) Use of table as per I:S 1742-1983 to determine relationship between gradient, diameter, discharge and velocity.

### **10. Sewerage Systems:**

- (i) Types of sewerage systems separate, combined & partially separate.
- (ii) Sewers : Stone ware, cast iron, concrete and masonry sewers their sizes and joints.
- (iii) Appurtenances: (Location, function and construction) manholes, drop manhole, lamp hole catch basin, inverted syphon, flushing tanks, ventilating shafts and storm water flows.
- (iv) Laying of sewers: Setting out alignment of sewer. Excavation, checking the gradient with the help of boning rods, preparation of bedding, handling, lowering, laying and jointing, testing and backfilling
- (v) Construction of surface drains and different sections required.

### **11. Building Drainage**

- (i) Aims of building drainage and its requirements. General layout of sanitary fittings and house drainage arrangement for a building (single and multistoried) as per IS 1742-1983.
- (ii) Different sanitary fittings and their installation. (iii) Traps, seal in traps, causes of breaking of seal, precautions taken, Gully, Intercepting and Grease traps.

### **12. Rural Sanitation:**

- (a) Drainage: Topography, alignment of lanes and byelanes, storm water, natural passage, development of drains, alignment, size and gradient. Phase Programme.
- (b) Disposal of night soil and village latrines :
  - (i) Collection and disposal of garbage and refuse.
  - (ii) Septic tanks, cess pools/soak pit (design of septic tank, soak pit/cess pools).
  - (iii) Biogas plant, constructional details, uses and maintenance.
- (c) Guide lines for future development of village.

**13. Maintenance:** Inspection of mains, cleaning and flushing of sewers. Precautions during cleaning, maintenance of traps, cleaning of house drainage line. Tools and equipment needed for maintenance.

### **14. Sewage Disposal**

- (i) General composition of sewage, importance & method of determination of O.D., B.O.D..
- (ii) Disposal methods. Land disposal, disposal by dilution and disposal in sea. Merits and demerits.
- (iii) Nuisance due to disposal, self-purification of streams, conditions of disposal.

### **15. Sewage Treatment:**

- (i) Meaning and principle of primary and secondary treatment, constructional details of screening chamber, grit chamber, clarifier, trickling filters, secondary clarifiers/aeration tank.
- (ii) Sludge treatment, sludge digestion, sludge drying; sludge disposal.
- (iii) Oxidation ponds.

### **DCE- 305 PUBLIC HEALTH ENGG. LAB**

#### **LIST OF EXPERIMENT-**

1. To determine dissolved and suspended solids in water.
2. To determine pH value of water sample.
3. To determine turbidity of water.
4. To calculate :
  - i. Oxygen Demand (OD)
  - ii. Biological Oxygen Demand (BOD)
  - iii. Chemical Oxygen Demand (COD)
5. To determine residual chlorine in water sample.
6. To perform Jar Test for Coagulants.
7. To collect samples of water from shallow & deep wells.
8. To perform chlorine demand test.
9. To determine hardness of water.
10. To determine available chlorine in bleaching powder.
11. To perform field test for the detection of intermediate pollution in drinking water by OT test.
12. To visit and write specific report for the following. (Any three)
  - a. Water treatment plant for moderate town (say Population 1lacs)
  - b. Sewage treatment plant for 5 lac to 10 lac population
  - c. Sewage disposal work
  - d. Construction site for layout of water supply & sewerage system.
  - e. Industrial effluent treatment plant

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**II Year III Semester**  
**DCE- 306 SURVEYING - I**

**1. Introduction**

Concept of surveying, purpose of surveying, Measurements linear and angular, units of measurement, instruments used for taking these measurements. Classification of survey based on instruments. Basic principles of surveying.

**2. Chain Surveying**

Purpose of chain surveying, Principles of chain surveying. Equipment used in chain surveying Viz. chains, tapes, ranging rods, arrows, pegs, cross staffs, Indian optical square their construction and uses. Different operations in chain surveying: Ranging (direct/indirect), offset (perpendicular/oblique), chaining (flat and sloping ground), conducting chain survey over an area. Recording the field data, plotting the chain survey, conventional sign. Obstacles in chain surveying.

(a) Errors in chain surveying.

(b) Correction for erroneous length of chain, simple problems. Testing and adjustment of chain.

**3. Compass Surveying**

Purpose of compass surveying. Construction and working of prismatic compass. Use of prismatic Compass, Method setting and taking observations. Concept of following:

(a) Meridian - Magnetic, true and arbitrary.

(b) Bearing- Magnetic, true and arbitrary.

(c) Whole circle bearing and reduced Bearing,

(d) Fore and back bearing.

(e) Magnetic dip and declination

Local attraction-causes, detection, errors and correction. Problems on local attraction, magnetic declination and calculation of included angles in a compass traverse. Concept of a traverse- Open and closed traverse. Traversing with a prismatic compass. Checks for an open and closed traverse. Plotting of a traverse - By included and deflection angles. Concept of closing error. Adjustment of traverse graphically by proportionate method. Errors in compass surveying. Testing and adjustment of a prismatic compass. Use of surveyors compass and its construction details, comparison with prismatic compass.

**4. Levelling**

Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and benchmarks. Principle and construction of dumpy, I.O.P. (tilting) levels. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis. Levelling staff (i) single piece (ii) folding (iii) spirit level

(iv) invar precision staff. Temporary adjustment: setting up and levelling, adjusting for parallax of Dumpy and I.O.P. level. Differential levelling, concept of back sight, fore sight, intermediate sight, station, change point, height of instrument. Level book and reduction of levels by

(a) Height of collimation method and

(b) Rise and fall method. Arithmetical checks. Problem on reduction of levels. Fly levelling, check levelling and profile levelling (L-section and X-section) Errors in levelling, and precautions to minimise them and permissible limits. Reciprocal levelling. Difficulties in levelling. Concept of curvature and refraction. Testing and adjustment of dumpy and IOP level. Numerical problems.

### **5. Minor Instruments :**

Principle construction and uses of the following minor instruments:

- (a) Abney's level
- (b) Tangent clinometer
- (c) Ceylone Ghat Tracer
- (d) Pentagraph
- (e) Planimeter

## **DCE- 306 SURVEYING - I (LAB)**

### **FIELD WORK ( Field Surveying - I )**

#### **1. Chain Surveying**

Ex.(i) (a) Ranging a line.

- (b) Chaining a line and recording in the field book.
- (c) Testing and adjustment of chain.

Ex.(ii)(a) Chaining of a line involving reciprocal ranging.

- (b) Taking offsets and setting out right angles with cross staff and Indian optical square.

Ex.(iii) Chain survey of a small area.

Plate I

Ex.(iv) Chaining a line involving obstacles in ranging.

#### **2. Compass Survey**

Ex.(v) (a) Setting the compass and taking observations.

- (b) Measuring angles between the lines meeting at a point by prismatic compass.

Ex.(vi) Traversing with the prismatic compass and chain of a closed traverse.

Setting a regular Pentagon of given side & bearing Plate III

Ex.(vii) Traversing with the Prismatic compass and chain of a closed and open traverse

Ex.(viii) Determination of local attraction at a station by taking fore and back bearing.

Ex.(ix) To find true bearing of a line at a place.

#### **3. Levelling:**

Ex.(x) To find the difference of level between two distant points by taking staff readings on different stations from the single setting.

Ex.(xi) To find the difference of level between two points by taking at least four change points.

Ex. (xii) Longitudinal sectioning of a road. Plate V

Ex.(xiii) Cross-sectioning of a road.

Plate VI

Ex.(xiv) Setting a gradient by IOP level.



#### **4.Minor Instrument :**

- Ex.(xv) Setting and checking grades with Abney's level. Setting and checking grades with Ceylone Ghat Tracer.
- Ex.(xvi) Finding heights by Indian Pattern Clinometer (Tangent Clinometer)
- Ex.(xvii) Use of plani meter for computing areas.
- Ex.(xviii) Enlargement/ reduction of a plan by the use of pantograph.

#### **Contouring:**

- Ex. (xix) Preparing a contour plan by radial line method by the use of a Tangent Clinometer / Tachometer. Plate-1.
- Ex. (xx) Preparing a contour plan by method of squares. Plate-1.

***Department of Civil Engineering***  
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**II Year IV Semester**

**DCE- 401 SOIL MECHANICS AND FOUNDATION ENGINEERING**

**1. Introduction**

- 1.1 Definition of soil Mechanics and foundation engineering.
- 1.2 Soil formation - different kinds of soils and soil structures.

**2. Fundamental Definitions and their Relationships**

- 2.1 Graphical representation of soils as a three phase system.
- 2.2 Definitions of moisture content unit weight of soil mass such as bulk density, saturated density, submerged density and dry density, specific gravity, mass specific gravity, void ratio, porosity & degree of saturation, percentage air voids and their content, density index.
- 2.3 Relationships between various terms stated above.
- 2.4 Consistency limits Liquid limit, Plastic limit, Shrinkage limit, Plasticity index, Consistency index.
- 2.5 Grain size analysis - Sieve and Hydrometer analysis C.C. and C.U.

**3. Classification of Soils**

- 3.1 Particle size classification - M.I.T., and I.S., U.S. bureau of soils and U.S. P.R.A.
- 3.2 Textural classification chart, brief description of plasticity chart.
- 3.3 I.S. soil classification.

**4. Permeability of Soils**

- 4.1 Definition of permeability.
- 4.2 Interpretation of Darcy's law, definition of discharge velocity and seepage velocity and coefficient of percolation.
- 4.3 Factors affecting permeability.
- 4.4 Laboratory methods of falling head and constant head, field methods of pumping-out tests and pumping-in tests.

**5. Compaction-**

- 5.1 Definition of Compaction.
- 5.2 Standard & modified Proctor compaction test.
- 5.3 Different methods of compaction.
- 5.4 Factors affecting compaction.
- 5.5 Brief discription of field compaction methods.
- 5.6 Compacting equipments and field control.
- 5.7 Indian Standards.

## **6. Consolidation**

- 6.1 Definition of consolidation and its importance on foundation settlement.
- 6.2 Difference between consolidation and compaction.

## **7. Shear Strength**

- 7.1 Definition of shear strength.
- 7.2 Definition of Cohesive & noncohesive soil with reference to c and  $\phi$  (phy) soil.
- 7.3 Coulomb's equation.
- 7.4 Shear box and unconfined compression tests.

## **8. Earth Pressure and Retaining Structures**

- 8.1 Definition of earth pressure, active and passive earth pressures, terms and symbols relating to a retaining wall.
- 8.2 Relation between movement of wall and earth pressure
- 8.3  $K_a$  and  $K_b$  by Rankin's Method.
- 8.4 Simple earth pressure calculations without surcharge.

## **9. Shallow and Deep Foundations**

- 9.1 Definitions of shallow and deep foundations
- 9.2 Application of Terzaghi's bearing capacity formulae for different types of foundations.
- 9.3 Factors affecting depth of shallow foundation
- 9.4 Plate load test for shallow foundations

## **10. Ground Improvement Techniques**

Concept of stabilization, materials used, advantages of lime & cement as stabilizing agents. Strength of stabilized soil. Deep compaction -Heavy tamping, Explosion, Grouting Reinforcement.

## **11. Soil Exploration and sampling**

- 12.1 Methods of exploration
- 12.2 Types of soil samples and samplers

### **DCE- 401 SOIL MECHANICS LAB**

- 1. Determination of moisture content by oven-drying method
- 2. Determination of specific gravity of soil particles by specific gravity bottle/pycnometer
- 3. Determination of soil particles size distribution by sieving
- 4. Determination of liquid limit and plastic limit of soil
- 5. Determination of permeability by constant Head Permeameter and falling head permeameter.
- 6. Shear strength of sand by Direct Shear test.
- 7. Unconfined compression test
- 8. Standard Proctor compaction test.
- 9. Determination of field density of soil by sand replacement and core cutter methods.
- 10. Demonstration of Standard Penetration Test.

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**DCE-402 BUILDING CONSTRUCTION AND MAINTENANCE ENGG.**

**1. Introduction:**

- (i) Definition of a building, classification of buildings based on occupancy.
- (ii) Different parts of a building. Orientation of buildings. Site selection.
- (iii) Exposure to building bylaws/master plan and building approval.

**2. Foundation**

- (i) Concept of foundation and its purpose.
- (ii) Types of foundations-shallow and deep.
  - (a) Shallow foundation - Constructional details of: Spread foundations for walls, Thumb rules for depth and width of foundation and thickness of concrete block stepped foundation masonry pillars and concrete columns, raft foundation, Grillage foundation and machine foundation.
  - (b) Deep foundations. Pile foundations, their suitability, classification of piles according to function, material and installation of concrete piles (under reamed, bored, compacted).
  - (c) Construction-preparing foundation plans, setting out, excavation, timbering and dewatering. Well point system.

**3. Walls**

- (i) Purpose of walls
- (ii) Classification of walls-Load Bearing and Non Load Bearing. Dwarf wall.
- (iii) Classification of walls as per materials of construction, brick, stone, reinforced brick, reinforced concrete, precast hollow and solid concrete block and composite masonry walls.
- (iv) **Brick masonry**-Definition of terms; mortar, bond, facing, backing, hearting, column, pillar, jambs, reveals, soffit, plinth, plinth masonry, Brick: header, stretcher, bed of brick, bat, queen closer, king closer, frog & quoin.
  - a) Bond-Meaning and necessity: Types of bond their suitability (Flamish, Header and Stretcher) 1, 1-1/2 and 2 Brick thick walls in English Bond. T, X and right angled corner junctions. Sketches for 1, 1-1/2 and 2 brick square pillars in English Bond.
  - (b) Construction of Brick walls-Method of laying bricks in walls, precautions observed in the construction of walls, method of bonding new brick work with old (Toothing, raking back and block bonding).
  - (c) Construction and Expansion Joints.

#### **(v) Stone Masonry**

(a) Glossary of terms-Natural bed of a surface, bedding planes, string course, corbel, cornice, block-in-course, grouting, moldings, templates, throating, through stones, parapet, coping, spalls, pilaster and buttress.

(b) Types of Stone Masonry: Rubble Masonry; random and coarsed, Ashlar Masonry, Ashlar fine, Ashlar rough tooled Ashlar facing, specifications for coarsed rubble masonry, principles to be observed in construction of stone masonry walls.

**vi) Partition walls:** Constructional details, suitability and uses of brick and wooden partition walls.(vii) Mortars-preparation, use and average strength of cement, lime, lime cement, lime surkhi and mud mortar (viii) Scaffolding:Constructional details and suitability of Mason's Brick Layers and Tubular scaffolding Centering & Shulteri (ix) Shoring & under pinning: Types and uses.(x) Safety in construction of low rise and high rise buildings.

#### **4. Arches and Lintels**

(i) Meaning and use of Arches and Lintels.

(ii) Glossary of terms used in Arches and Lintels-Abutment, Peir, Arch ring,Intrados, Soffit Extrados, Voussoiers, Springer, Springing line, Crown, Key stone, Skew back, Span, Rise, Depth of an Arch, Haunch, Spandril, Jambs, Bearing, Thickness of lintel, Effective span.

(iii) Arche:

(a) types of Arches-Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving.

(b) Stone arches and their construction.

(c) Brick arches and their construction.

#### **5. Doors and windows:**

(i) Glossary of terms, used in Doors and Windows.

(ii) Doors-Name;uses and sketches of Metal doors; Ledged and Battened Doors;Ledged, battened and braced door; Framed and Panelled doors;glazed and panelled doors;flush doors; collapsible doors; Rolling steel shutters, side sliding doors;Door frames, PVC shutters & metal doors.

(iii) Windows-names,uses and sketches of metal windows,fully paneled windows, fully glazed windows, casement windows, fanlight windows and ventillators, sky light window frames, Louvered shutters ( emphasis shall be given for using metals and plastics etc. in place of timber).

#### **6. Damp Proofing**

(i) Dampness and its ill effects on bricks, plaster, wooden fixtures, fixtures and reinforcement, damage to aesthetic appearance. Damage heat insulating materials, Damage to stored articles and health. (ii) Types of dampness-moisture penetrating the building from outside e.g. rainwater, surface water, ground Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e water in kitchen and bath rooms etc.

## 7. Floors

- (i) Ground floor
- (a) Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose.
- (b) Types of floor finishes-cast in situ concrete flooring (monolithic, bonded) Terrazzo tile flooring. Terrazzo flooring, Timber flooring. Description with sketches of the methods of construction of the floors and their specifications. Floor polishing equipment.
- (ii) Upper floors:(a) Flooring on RCC Slab.(b) Flooring on R.B. Slab.

## 8. Roofs:

- (i) Glossary of terms for pitched roofs-batten, eaves, barge, fascia board, gable hip, lap, purlin,rafter, rag bolt, valley,ridge.
- (ii) Pitched roof, steel trusses, fink truss, arched trusses, North light truss.
- (iii) Roof coverings for pitched roofs-Asbestos sheeting, big six, Trafford sheets, Mangalore tiles, method of arranging and fixing to the battens, rafters, purlins-both steel and wooden.
- (iv) Drainage arrangement for pitched roofs.
- (v) Concept of Flat roofs, RCC, RB, Coffered & folded slabs.
- (vi) Drainage arrangements for flat roofs.

## 9. Stairs and staircase:

- (i) **Glossary of terms:** Stair case winders landing, strings, newel, user, riser, tread, width of staircase, hand rail, nosing.
- (ii) **Planning and layout of staircase:** Relations between rise and tread, determination of width of stair, landing etc. Various types of layout-straight flight, dog legged, open well quarter turn, half turn, Newel and geometrical staircase). Bifurcated stair, spiral stair.

## 10. Surface Finishes:

- (i) Plastering-Classification according to use and finishes like grit finish, rough cast, pebble dashed, plain plaster etc. Dubbing, Proportion of mortars used for different plasters, preparation of mortars, techniques of plastering and curing.
- (ii) Pointing-Different types of pointing, mortar used and method of pointing.
- (iii) Painting-preparation and application of paints on wooden, steel and plastered wall surfaces.
- (iv) White washing, color washing and is tempering. Application of cement and plastic paints.
- (v) Commonly used water repellants for exterior surfaces, their names and application.

## 11. Ventilation and Air Conditioning:

Natural and Artificial Ventilation. Requirements of comfort conditions, temperature control, mechanical ventilation, plenum system, exhaust system, air filter of different types, principle of Air Conditioning Plant

**12. Fire Fighting:** Causes of fire, spread of fire, firefighting equipment and different method, of fire fighting, sprinklers, fire regulations and requirement. Fire insurance. Indian Standard.

### **13. Principles of Maintenance**

- 13.1 Definition, of maintenance, decay and deterioration of building/building component's.
- 13.2 Sources and causes of deterioration and decay in building.
- 13.3 Factors influencing the decision to carry out maintenance of building.

### **14. Maintenance Practice**

- 14.1 Defects, causes and repairs in structural elements of buildings such as
  - (i) Foundation
  - (ii) Walls
  - (iii) Floors
  - (iv) Roof
  - (v) Components such as doors, windows and ventilators etc.
- 14.2 Defects, causes and repairs in surface finishes such as
  - (i) White and colour washing
  - (ii) Distempering
  - (iii) Cement Plastering,
  - (iv) Painting of timber and steel surface
- 14.3 Defects, causes and repairs in building due to leakage and seepage & their prevention
- 14.4 Defects causes and repair in internal environment of building such as
  - (i) Heating
  - (ii) Ventilation and Air conditioning
  - (iii) Lighting
- 14.5 P.W.D. Practices with respect to maintenance of building e.g. annual repairs, special repairs.

**15. Safety in Maintenance :** Necessity, specific safety measures at site e.g. barricades, signals, helmets.

### **16. Water Harvesting :**

- i. Causes of depletion of water label in state.
- ii. Present scenario of ground water in state.
- iii. Significance of hydrological parameters.
- iv. Rain water harvesting.
- v. Roof top rain water harvesting.
- vi. Methods of ground water recharging.
- vii. Precaution in ground water recharging.

## **DCE-402 Building Construction & Maintenance Lab**

### **LIST OF EXPERIMENT-**

- (i) Layout of a building.
- (ii) To construct brick bonds (English and Flemish bonds) in one, one and half and two brick thick (a) walls. L, T and cross junction. (b) Columns
- (iii) Visit to construction site for showing the following item of works and to write specific report about the works seen.
  - (a) Timbering of excavated Trenching
  - (b) Construction of Masonry Walls
  - (c) Flooring: Laying of flooring on an already prepared lime concrete base.
  - (d) Plastering and Pointing of wall
  - (e) Finishing of wall surface by Lime, Distemper, Snowcap, etc. and calculation of material in 100 Sqm. wall area
  - (f) Use of Special type of shuttering/crains/heavy machines in construction work.

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**DCE -403 CONCRETE TECHNOLOGY**

**1. Introduction**

Definition of concrete. Brief introduction to properties of concrete. Advantages of concrete. Uses of concrete in comparison to other building materials.

**2 Ingredients of Concrete:**

**(i) Cement:-** The chemical ingredients causing changes in properties, situations of use and special precautions in use of the following types of cement: Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, quick setting, white and colored cements.

**(ii) Aggregates:-**Classification of aggregates according to source, size and shape. Characteristics of aggregates particle size and shape, surface texture; specific gravity of aggregate; bulk density, water absorption surface moisture, bulking of sand and deleterious materials in the aggregate. Grading of Aggregate:-Coars aggregate, fine aggregate; All in-aggregate; fineness modulus; interpretation of grading charts and combination of two aggregates.

**(iii)Water:-**Limits on the impurities as per ISI;affect of excessive impurities on concrete, Ascertaining the suitability of water with the help of concrete cube test.

**3. Water Cement Ratio-**Hydration of cement, Effect of various W/C ratios on the physical structure of hydrated cement, water cement ratio law and conditions under which the law is valid; internal moisture, temperature, age, and size of specimen. Definition of cube strength of concrete. Relations between water cement ratio and strength of concrete. Use of CBRI chart.

**4. Workability:-**Definition, of workability. Concept of:Internal friction,, Segregation, Harshness. Factors affecting workability; water content, shape, size and percentage of fineness passing 300 mic. Measurement of workability slump test, compaction factor test.Recommended slumps for placement in various conditions. Vee-Bee Consist meter.

**5. Proportioning for Ordinary Concrete:**

Object of mix design, Strength required for various grades as per IS 456, Preliminary test, Works cube test. Proportioning for ordinary mix as prescribed by IS and its interpretation. Adjustment on site for: Bulking, water Absorption, Workability Design data for moisture, bulk age, absorption and suitable fine aggregate and coarse aggregate ratio. Difference between ordinary and controlled concrete.



## **6. Form Work:**

- (i) Concept of factors affecting the design of form work (shuttering and staging)
- (ii) Materials used for form work.
- (iii) Sketches of form work for column, beams slabs.
- (iv) Stripping time for form work as per IS  
(No problems on the design of form work).
- (v) Removal of formwork.
- (vi) Precautions to be taken before, during and after RCC Construction.
- (vii) Special type of formwork

## **7. Concrete Operations:**

- (i) Storing Cement:
  - (a) Storing of cement in the warehouse.
  - (b) Storing of cement at site.
  - (c) Effect of storage on strength of cement.

**Aggregate:-** Storing of aggregate on site for maintaining uniformity of moisture and cleanliness.

### **(ii) Batching:**

- (a) Batching of cement.
- (b) Batching of aggregate: Batching by volume, using gauge box, selection of proper gauge box, Batching by weight-spring balances and by batching machines.
- (c) Measurement of water.

### **(iii) Mixing**

- (a) Hand mixing
- (b) Machine mixing-types of mixer, capacities of mixers, choosing appropriate size of mixers, operation of mixers, mixing of water.
- (c) Maintenance and care of machines.

### **(iv) Transportation of Concrete:**

Transportation with and situations of use of the following- pans, wheel barrows, truck mixers, chutes, belt conveyors, pumps, tower cranes.

### **(v) Placement of Concrete:**

- (a) Prior preparation before placement; when put on natural soil, rocky base, specially prepared sub-base (brick soling and water bound macadam base), hardened concrete base, checking of form work, checking provision for joints.
- (b) Placement of concrete-precautions to be taken.

### **(vi) Compaction:**

- (a) Hand compaction-pavement, narrow and deep members.
- (b) Machine compaction-types of vibrators (internal screed vibrators and form vibrators) Method of handling screed vibrations and immersion vibrations. Suitability of concrete mixes for compaction with vibrators. Selection of suitable vibrators for various situations.

(vii) **Finishing** -concrete slabs-screening, floating, and troweling.

- (viii) **Curing**-Object of curing, Method of curing, shading concrete works, covering surfaces with hessian, gunny bags, sprinkling of water, ponding method and membrane curing, steam curing. Recommended duration for curing.

(ix) **Jointing** - Location of construction joints, treatment of construction joint before the concrete is poured, concreting at these joints. Expansion joints in concrete in buildings-their importance and location.

## **8. Properties of Concrete:**

### **(i) Properties in plastic stage:**

- (a) Workability                      (b) Segregation.                      (c) Bleeding.

### **(ii) Properties of hardened concrete:**

- (a) Strength. Characteristic strength                      (b) Durability  
(c) Impermeability.                      (d) Dimensional changes.

### **(iii) Admixture (uses and effect)**

- (a) Accelerators and retarders.  
(b) Air entraining agents.  
(c) Water reducing and set controlling agents.

**9. Quality Control at site:-**Control tests on cement, aggregate water and concrete. Concept of quality control.

**10. Hot Weather Concreting:-** Effect of high temperature on concrete strength with reference to mass concreting, cooling of concrete materials, precautions before, during and after concreting, Use of retarders.

**11. Cold Weather Concreting-**Effect of low temperature on concrete strength, Heating of concrete materials. Precaution before, during and after concreting. Use of accelerators.

## **12. Repair and Maintenance**

Method of repairing by grouting new and old concrete work for cracks and holes. Repairs underwater.

## **13. Special types of concrete**

- (i) General idea of special types of concrete , High strength concrete, fiber reinforced concrete, polymer concrete, fibrocement concrete. ready-mix concrete.  
(ii) Recycle concrete.  
(iii) High performance concrete.

## **CONCRETE TECHNOLOGY LAB**

(Common to three year Diploma course in Civil Engg)

- (i) To determine flakiness index and elongation index of coarse aggregate (ISI:2386-pt.1-1963)  
(ii) Field method to determine fine silt in aggregate.  
(iii) Determination of specific gravity and water absorption aggregates (IS:2386 Part-III-1963) (for aggregates (40mm to 10mm)  
(iv) Determination of bulk density and voids of aggregate (IS:2386-Part-III-1963)

- (v) Determination of surface moisture in fine aggregate by displacement method (IS:2383-Part-III-1963)
- (vi) To determine necessary adjustment for bulking of fine aggregate by field method (IS:2383-Part-III-1983).
- (vii) Test for workability (slump test);
  - (a) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/cement ratio on slump.
  - (b) To test cube strength of concrete with varying water cement ratio.
- (viii) Compacting factor test for workability (IS:1199-1959)
- (ix) Workability of concrete by Vee-Bee consistometer.
- (x) Fineness modulus of sand.

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**DCE- 404 CIVIL ENGINEERING DRAWING-I**

1. **Symbols and conventions of materials** and fittings used in Civil Engineering works.
2. **Symbols and conventions used for electrical fittings.**
3. **Foundations:** Foundations, details of a spread foundation for an external and internal masonry wall with basements showing necessary damp proofing arrangements.
4. **Doors and Windows :**
  - (a) **Doors:** Elevation, sectional plan, sectional side elevation of ledged braced and battend door, glazed door and flush door with wire gauge shutter, partly panelled and glazed door, fully panelled door.
  - (b) **Windows:** (i) Elevation, sectional plan, sectional side elevation of fully glazed window and fully panelled window with fan light.  
(ii) Elevation, sectional plan and sectional side elevation of a glazed steel window.
5. **Roofs-** King post & queen post roof trusses with roof covering and support details on wall. Section through RCC & RB flat roof showing details regarding arrangements for water proofing, drainage and heat insulation.
6. **Floors:** Detailed cross-sections of the following types of concrete flooring as per IS:2571-1970.
  - (a) Concrete floor finish over ground floor.
  - (b) Terrazo floor finish over ground floor.
  - (c) Concrete floor finish with structured slab.
  - (d) Terrazo floor finish structured slab.
  - (e) Terrazo tile floor finish over ground.
7. **Working drawing of a two roomed building** with kitchen and bath having pitched roof.
8. **Working drawing of a three roomed building** from a given line plan and given data.
9. **Working drawing of a three bed room double storied flat** roofed residential building.
10. **Stair case-** a. Details of dog legged stairs (Wooden & RCC).  
b. Plans of remaining type of stairs.
11. a. Details plan and section of an inspection chamber and manhole.  
b. Detailed plan and cross section of a domestic septic and soak pit for 10 users as per IS:2470 Part I.
12. Detailed plan and cross section of bathroom, kitchen and W.C. connections.
13. Detailed drawing of pipe joints commonly used in water supply and sewerage system.
14. Two Room building working drawing with AutoCad-2007 on wards
15. Three Room building working drawing with AutoCAD .

## EVALUATION SCHEME

Diploma – Civil Engineering Semester-V						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-501	Design Of Reinforced Concrete Structure	30	70	NA	NA	100
DCE-502	Transportation Engg.	30	70	NA	NA	100
DCE-503	Est .Cost. & Valuation	30	70	NA	NA	100
DCE-504	Surveying -II	30	70	25	25	150
DCE-505	Irrigation Engg.	30	70	NA	NA	100
DCE-506	Integrative comm.. (PRACTICAL)	NA	NA	25	25	50
Semester-VI						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DCE-601	Environmental Pollution & Control	30	70	NA	NA	100
DCE-602	Design of Steel & Masonary Structure	30	70	NA	NA	100
DCE-603	Construction Management, Accounts & Entrepreneurship Development	30	70	NA	NA	100
DCE-604	Civil Engineering Drawing-II	30	70	NA	NA	100
DCE-605	Earthquake Engineering	30	70	NA	NA	100
DCE-606	Project	NA	NA	25	25	50

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**DME 501: Industrial Management and Entrepreneurship Development**

**1. Principles of Management**

- 1.1 Management, Different Functions: Planning, Organizing, Leading, Controlling.
- 1.2 Organizational Structure, Types, Functions of different departments.
- 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
- 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.

**2. Human Resource Development**

- 2.1 Introduction, objectives and functions of human resource development (HRD) department.
- 2.2 Recruitment, methods of selection, training strategies and career development.
- 2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection – Procedure – training of workers, Job evaluation and Merit rating.

**3. Wages and Incentives**

- 3.1 Definition and factors affecting wages, methods of wage payment.
- 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
- 3.3 Job evaluation and merit rating.

**4. Human and Industrial Relations**

- 4.1 Industrial relations and disputes.
- 4.2 Relations with subordinates, peers and superiors.
- 4.3 Characteristics of group behavior and trade unionism.
- 4.4 Mob psychology.
- 4.5 Grievance, Handling of grievances.
- 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
- 4.7 Labour welfare schemes. 4.8 Workers' participation in management.

**5. Professional Ethics**

- 5.1 Concept of professional ethics.
- 5.2 Need for code of professional ethics.
- 5.3 Professional bodies and their role.

**6. Sales and Marketing management**

- 6.1 Functions and duties of sales department.
- 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
- 6.3 Concept of marketing. 6.4 Problems of marketing.
- 6.5 Pricing policy, break even analysis.
- 6.6 Distribution channels and methods of marketing.

**7. Labour Legislation Act (as amended on date)**

- 7.1 Factory Act 1948.
- 7.2 Workmen's Compensation Act 1923.

7.3 Apprentices Act 1961. 7.4 PF Act, ESI Act.

7.5 Industrial Dispute Act 1947.

7.6 Employers State Insurance Act 1948.

7.7 Payment of Wages Act, 1936.

7.8 Intellectual Property Rights Act

## **8. Material Management**

8.1 Inventory control models.

8.2 ABC Analysis, Safety stock, Economic ordering quantity.

8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.

8.4 Material handling techniques.

## **9. Financial Management**

9.1 Importance of ledger and cash book.

9.2 Profit and loss Account, Balance sheet.

9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

## **10. Entrepreneurship Development**

10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.

10.2 Distinction between an entrepreneur and a manager.

10.3 Project identification and selection.

10.4 Project formulation.

10.5 Project appraisal.

10.6 Facilities and incentives to an entrepreneur.

## **11. Fundamental of Economics**

11.1 Micro economics.

11.2 Macro economics.

## **12. Accidents and Safety**

12.1 Classification of accidents based on nature of injuries, event and place.

12.2 Causes and effects of accidents.

12.3 Accident-prone workers.

12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.

12.5 Safety consciousness and publicity.

12.6 Safety procedures.

12.7 Safety measures – Do's and Don'ts and good housing keeping.

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**DCE-502 Design Of Reinforced Concrete Structure**

**INTRODUCTION-** Concept of reinforced concrete structures, advantages and disadvantages. Different materials used in RCC With their properties. Load and loading standard as per IS:875 Concept of design of reinforced concrete based on working stresses method and limit state method and their difference.

**2(A) Design based on Working Stress Method**

**I. Fundamental of working stress method:**

- (i) Assumptions in the theory of simple bending for RCC beams.
- (ii) Flexural strength of a singly reinforced RCC beam. Position of the Neutral Axis. Resisting moment of the section, critical neutral axis, actual neutral axis, concept of balanced, under reinforced and over-reinforced sections.

**(iii) Shear Strength :** -Permissible shear stresses as per IS:456. Development of stresses in reinforcement, development length and anchoring of bars.

**(iv) Bond Strength:-**Concept of bond, local and average, permissible bond stresses for plain and deformed bars as per IS, minimum length of embedment of bars, minimum splice length, actual bond stress in RCC beams and slabs, bond length as per IS: 456.

**II. Design of singly reinforced concrete beams as per IS:456** from the given data such as span, load and properties of materials used.

**III. Design of lintel.**

**IV. Design of a cantilever beam and slab.**

**V. Design of Doubly Reinforced Concrete Beams:**

- (i) Doubly reinforced concrete beam and its necessity.
- (ii) Strength of a double reinforced concrete beam section.
- (iii) Method of design: Simple problems only.
- (iv) Reinforcement details of doubly reinforced concrete beam.

**VI. Design of RCC Slabs:**

- (i) Structural behavior of slabs under uniformly distributed load (UDL).
- (ii) Types of end supports.
- (iii) Design of one way slab.
- (iv) Design of Two-way slab with the help of tables of IS:456.(Corners not held down)-IS-code method.
- (v) Detailing of reinforcement.

**VII. Design of Reinforced Brick-Work**

- (i) Plain brick masonry, permissible stresses.
- (ii) Reinforced Brick work and its use in slabs and lintels.



- (iii) Limitations of the use of R.B. Work.
- (iv) General principles of design of reinforced brick lintels and slabs.
- (v) Design of R.B. beams, slab and lintels.

**VIII. Design of Tee Beams:**

- (i) Structural behavior of a beam and slab floor laid monolithically.
- (ii) Rules for the design of T-Beams.
- (iii) Economical depth of T-Beams, Strength of T-Beams.
- (iv) Design of singly reinforced Tee-Beams.
- (v) Detailing of reinforcement.

**IX. Design of Columns & Column Footings**

- (i) Concept of long and short columns.
- (ii) IS specifications for main and lateral reinforcement.
- (iii) Behavior of RCC column under axial load.
- (iv) Design of Axially loaded short and long columns with hinged ends (circular, square).
- (v) Concept of column footing. Design criteria. Design of square isolated column footings.
- (vi) Detailing of reinforcement.

**X. Cantilever Retaining Wall:-**Concept of design and function of different parts of a cantilever retaining wall and reinforcement details

**XI. Components of Overhead Water Tanks (Dome Shap):-** Description of different component e.g. roof, side wall and ring beam, floor slabs, supporting structure and foundations (only reinforcement details be shown and emphasized)

**XII. Components of Multi-Storied Framed Structures:-**General concept of multistoried framed structures of columns, beam, slabs, and footing, design criteria and method of placing reinforcement in framed structures. Lifts basements (only diagrams to be taught. No numerical shall be asked in the examination)

**2(B) Design Based on Limit State Method:**

- I. Fundamentals of Limit State Method
  - i. Theory of limit state method.
  - ii. Partial safety factors.
  - iii. Flexural strength.
  - iv. Shear Strength.
  - v. Development Length of bars.
- II. Design requirements.
- III. Design of the following :
  - i. Singly reinforced rectangular beam.
  - ii. One way slab (simply supported)

**3. Pre-Stressed Concrete**

- i. Concept of prestressing.
- ii. Situations where prestressed concrete is used.
- iii. Materials used in prestressed concrete and their specifications as per IS.
- iv. Post-tensioning and pre-tensioning.
- v. Systems of prestressing.
- vi. Freyssinet, Magnol-Blaten and Lee-Mecall systems
- vii. Sketch showing Prestressing arrangement for RCC beam

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**(R.C.C. LAB)**

**PRACTICAL'S-** Preparation of bar bending schedule and to bend the by accordingly for the following:

- (i) Singly reinforced concrete beam
- (ii) Doubly reinforced concrete beam
- (iii) Reinforced concrete column
- (iv) Reinforced concrete slab
- (v) Introduction of STADD.PRO or AUTO CAD software

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**III Year V Semester**

**DCE- 503 TRANSPORTATION ENGINEERING**

**A : HIGHWAYS**

**1. Introduction**

- (i) Importance of Highway transportation.
- (ii) Functions of IRC.
- (iii) IRC classification of roads.
- (iv) Organization of state highways department.

**2. Road Geometrics:**

- (i) Glossary of terms used in geometrics and their importance; Right of way, formation width, road margin, road shoulder, carriage way, side slopes, Krebs, formation levels, camber and gradient.
- (ii) Design and average running speed, stopping and passing sight distances.
- (iii) Curves necessity, horizontal and vertical curves including transition curves and super elevation, Methods of providing super elevation
- (iv) Use of IRC design tables and specifications for finding elements of Road geometrics. Drawing of typical cross-sections in cutting and filling on straight and at a curve.
- (v) Under pass & over pass (fly over and bridges)

**3. Highway Surveys and Plans**

- (i) Designation of a topographic map. Reading the data given on a topographic map.
- (ii) Basic considerations governing alignment for a road in plain and hilly area.
- (iii) Highway location. Marking of alignment. Importance of various stages viz:
  - (a) Reconnaissance survey: Conduct reconnaissance and prepare reconnaissance report.
  - (b) Preliminary survey: Object, organizing, conducting and informations to be collected.
  - (c) Location survey.
  - (d) Standards for preparing the highway plans as per Ministry of Transport.

**4. Traffic Engineering**

- (i) Traffic studies , Methods of collection and presentation of volume count d
- (ii) Traffic control devices - Signs, markings and signals, their effectiveness and location, installation of signs, IRC standards.
- (iii) Segregation of traffic.
- (iv) Types of intersections and choice of each.
- (v) Accidents: Types, causes and remedies.

**5. Road Materials:**

- (i) Different types of road materials in use; soil, aggregates binders.
- (ii) Function of soil as Highway sub grade.
- (iii) C.B.R; Method of finding. CBR value and its significance.

(iv) Testing aggregates : Abrasion test, impact test, crushing strength test, water absorption test and soundness test.

(v) Aggregates: Availability of road aggregates in requirements of road aggregates as per IS specifications.

(vi) Binders: Common binders; cement, bitumen and Tar, properties as per IS specifications, penetration and viscosity test, procedures and significance. cut back and emulsion and their uses.

## **6. Road Pavements ; Types and Their Construction**

(i) Road pavement : Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components.

(ii) Sub-grade preparation -Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, Cornrow pits, mutams, making profiles of embankment, construction of embankment, compaction, stabilization, preparation of subgrade. methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for sub grade preparation.

(iii) **Flexible pavements:** sub base necessity and purpose. stabilized sub base; purpose of stabilization.

Types of Stabilization: (a) Mechanical stabilization. (b) Lime stabilization.  
(c) Cement stabilization. (d) Fly ash stabilisation.  
(e) Granular sub base

### **(iv) Base course:**

(a) Brick soling. (b) Stone soling. (c) Metalling: water bound macadam & bituminous macadam.

(v) Surfacing: Types of surfacing;

(a) Surface dressing. (b) (i) Premix carpet. (ii) Semi dense carpet (S.D

(c) Asphalt concrete. (d) Grouting.

(vi) Rigid pavements-Construction of concrete roads as per IRC specifications: Form laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.

## **7. Hill Roads:**

(i) Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cut and partly in fill.

(ii) Landslides : Causes, preventions and control measures.

## **8. Road Drainage:**

(i) Necessity of road drainage work, cross drainage works.

(ii) Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross-sections.

## **9. Road maintenance:**

(i) Common types of road failures-their causes and remedies such as bagie action.

(ii) Maintenance of bituminous roads such as patch work & resurfacing. Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices.

**10. Construction Equipment:** Output and use of the following plant and equipment's:

- (i) Hot Mix Plant & Mix all battery.
- (ii) Tipper, tractors (wheel and crawler) scraper, bull-dozer, dumpers, showels, grader, roller, dragline.
- (iii) Asphalt mixer and tar boilers.
- (iv) Road pavers.

**11. Arboriculture:**

Names of trees used in arboriculture, distance of trees from center of roads and distance between center to center of trees, tree guards, maintenance and revenue from trees.

**B : RAILWAYS**

**1. Introduction:** Railways - An important system of communication in India.

**2. Permanent Way:**

Definition of a permanent way; components of a permanent way, subgrade, ballast, sleepers, rails, fixtures and fastenings. Concept of gauge and different gauges prevalent in India. Suitability of these gauges under different conditions.

**3. Track Materials:**

(i) **RAILS:** Function of rails. Different types of rail sections-double header, bull headed and flat footed their standard length, weights and comparison. Welded rails-appropriate length of welded rails and advantages of welded rails .Creep: Its definition, causes, effects prevention. Wear of rails: its causes and effects.

(ii) **SLEEPERS:** Function of sleepers; Different types of sleepers: wooden ,steel ,cast iron (pot type),concrete and pre-stressed concrete, their sizes, shapes, characteristics and spacing.

(iii) **BALLAST:** Function, materials used for making ballast stone, brick, slag and cinder, their characteristics.

(iv) **FIXTURES AND FASTENINGS:**

(a) Connections of rail to rail-Fishplate and fish bolts.

(b) Connection of Rail to sleepers: Sketches of connection between flat footed rails with various type sleepers with details of fixtures and fasteners used.

**4. Geometrics for Broad Gauge:**

Typical Cross-sections of single and double broad gauge railway tracks in cutting and embankment. Permanent and temporary land width. Gradients- ruling, maximum,-minimum for drainage. Gradients in station yards. Curves; Limiting radius of a curve for broad gauge.

Transition length to be provided for railway curves as per railway code. Super-elevation-its necessity and limiting value. Definition of equilibrium cant and cant deficiency, widening of gauge on curves.

**5. Points and Crossings:**

Necessity and details of arrangement; sketch of a turnout definition stock rail, tongue rail, check rail, lead rail, wing rail, point rail, splice rail, stretcher bar, throw of switch, heel of switch, nose of crossing,angle of crossing, overall length of turnout, facing and trailing points,diamond crossing, cross over, triangle.

**6. Track Laying**

Preparation of sub grade. Collection of materials setting up of material depot and carrying out initial operations such as adzing of sleepers, bending of rails and assembling of crossings.

Definitions of base and rail head. Transportation by material trolleys, rail carriers and material trains. Method of track laying (parallel, telescopic and American methods) Organization of layout at rail head. Ballasting of the track.

### **7. Maintenance of Track:**

- (i) Routine maintenance of formation and side slopes, rails, fixtures and drainage
- (ii) Special maintenance - Replacement of defective sleepers and rails.
- (iii) Tools used for the above operations.

## **C : BRIDGES**

**1. INTRODUCTION;** -Bridge: Its function and component parts, different parts, difference between a bridge and a culvert.

**2. CLASSIFICATION OF BRIDGES:** Their structural elements and suitability:

- (i) According to life: Permanent and temporary.
- (ii) According to road way level : Deck, through and semi-through.
- (iii) According to material: Wooden, steel, RCC, pre-stressed and masonry.
- (iv) According to structural form:
  - (a) Beam type-RCC,T-Beam, steel girder bridges, plate girder and box girder, trussed bridges N and warren girder bridges.
  - (b) Arch type-open spandrel and filled span drill, barrel and rib type.
  - (c) Suspension type-Unstiffened sling type, its description with sketches.
  - (d) According to the position of highest flood level: submersible and non-submersible

### **3. Site selection and collection of data:-**

- 1.Factors affecting the selection of site for a bridge data to be collected.
- 2.Bridge span: Economical span and factors affecting it

**4. Piers, abutments and wing walls:-**Piers: Definition parts. Types:solid (masonry and RCC); Open cylindrical and abutment piers. Definition of the following terms;height of pier,water way (natural and artificial),afflux and clearance. Abutments and wing walls: Dification, types of abutments (straighttee) abutment with wing walls (straight, splayed, return and curved).

**5. Bridge Bearings:-**Purpose of bearings:Types of bearings:Fixed plate, sliding plate,deep cast base, rocker and roller bearings, their functions with sketches.

**6. Temporary Bridges:-** Necessity, description with sketches of pontoon and boat bridges.

**7. Maintenance of Bridges:** -Inspection of bridges, routine maintenance.

**8. Air Port :-**Basic Element, Runway and Taxi Way.

**9. Tunnel :-**Introduction, Classification and Construction Method.

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**Transportation Engg. Lab.( C-3 Lab )**

**List of Experiments**

1. Determination of resistance abrasion of aggregates by Los -Angel's Abrasion Testing Machine.
2. Determination of Aggregate impact value by aggregate impact tester.
3. Determination of C.B.R. Value of sub grade soil.
4. Determination of Aggregate crushing value by aggregate crushing test apparatus.
5. Determination of Penetration Value of bitumen.
6. Determination of softening point of bitumen.
7. Determination of ductility of bitumen.
8. Determination of flash and fire point of bitumen.

**Field Visits of at least 3 of the following (in different fields):-**

- 1 Railway yard and station, points and crossing, rack communication, control and panel Board.
2. Railway Museum for the development of Railways, Rails Mono Rails, Sleepers--  
R.D.S.O. Luck now & Rail Bhawan Delhi
3. Bridges under construction. Grade separator.
4. Factory for construction of prestressed sleepers or other fixtures.
5. P.W.D. Research Lab at Luck now/C.B.R.I. Rookie
6. Hume Pipe Factory.

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**III Year V Semester**

**DCE-504 ESTIMATING, COSTING AND VALUATION**

**A Buildings**

**1. Introduction to Estimating:** Types of estimates, drawings, (to be attached with these estimates. Preparation of rough cost estimates).

**2. Units of measurement,** and units of payment of different items of work.

**3. Different methods of taking out quantities:** Centre line in-to-in/out-to-put methods.

**4. (a) Preparation of a detailed estimate,** complete with detailed reports, specifications, abstract of cost and material statement for a small residential building with a flat roof.

**( b) Preparation of a detailed estimate** with specification, abstract of cost and material statement for pitched roof with steel truss only.

**5. Specifications:-**Need, general and detailed specifications, method of writing specifications,

**Analysis of rates:**

(i) Steps in the analysis of rates for any item of work, requirement of material, labour, sundries T.& P. contractors profit.

(ii) Calculation of quantities of materials for:

(a) Plain cement concrete of different proportions.

(b) Brick masonry in cement and lime mortar.

(c) Plastering and pointing with cement mortar in different proportions.

(d) White washing.

**6. Analysis of Rates**

Analysis of rates of the following item of work when the data regarding labour, rates of material and rates of labour is given.

(a) Earth work in excavation and filling with a concept of lead and lift.

(b) Cement concrete in foundation.

(c) R.C.C. and R.B. in roof slabs.

(d) First class burnt brick masonry in cement mortar.

(e) Cement plaster.

(f) Cement pointing: Flush, deep pointing.

**7. Tender and preparation of tender document.**

**B. Irrigation**

8. Preparation of detailed estimate for a brick lined distributory from a given section.

**C. Public health**

9. Preparation of detailed estimate for laying a water supply line (C.I.Pipe).

10. Preparation of detailed estimate for sanitary and water supply fittings in a domestic building containing one set of toilets and septic tank.



**D. Roads**

11. Methods for calculating earth work using:
  - (i) Average depth.
  - (ii) Average cross sectional area.
  - (iii) Graphical method.
12. Calculations of quantities of materials for roads in plains from given drawings.
13. Preparation of detailed estimate using the above quantities.
14. Detailed estimate of a single span slab culvert with return wing walls.
15. Calculation of quantities of different items of work for a masonry retaining wall from given drawings.

**E. Valuation**

16. Purpose of valuation, principles of valuation.
17. Definition of terms such as depreciation, sinking fund, salvage and scrap value.
18. Valuation of a building property by replacement cost method and rental return method.
19. Method of calculation of standard rent-Concept of capitalized value and years purchase.

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**III Year V Semester**  
**DCE- 505 SURVEYING II**

**1. Plane Table surveying:**

- (i) Purpose of plane table surveying. Equipment used in plane table survey (a) Plane table, (b) Alidade (Plain and Telescopic), (c) accessories.
- (ii) Method of plane tabling (a) centering (b) levelling (c) Orientation.
- (iii) Methods of plane table surveying (a) Radiation, (b) intersection, (c) Traversing (d) Resection.
- (iv) Two point problem.
- (v) Three point problem by
  - (a) Mechanical Method (Tracing paper)
  - (b) Bessel's Graphical Method.
  - (c) Trial and error method.

**2. Contouring:-** Concept of contour: Purpose of contouring; Contour interval and horizontal equivalent; Factors affecting contour interval; characteristics of contour; Methods of contouring direct and indirect, use of stadia measurements in contour survey. Interpolation of contours; Use of contour map; Drawing cross section from a contour map; Marking alignment of a road, railway and a canal on a contour map; Computation of earthwork and reservoir capacity from a contour map.

**3. Theodolite Surveying:-** Working of a transit vernier theodolite, Fundamental axes of a theodolite and their relation; Temporary adjustments of a transit theodolite; least count and concept of transiting, swinging, face left, face right and changing face; Measurement of horizontal and vertical angles. Prolonging a line (forward and backward) Measurement of bearing of a line; Traversing by included angles and deflection angle method; traversing by stadia measurement; Theodolite triangulation and plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected); Errors in theodolite survey and precautions taken to minimise them; Limits of precision in theodolite traversing. Principle and working of a micro-optic theodolite. Brief introduction to tachymetry. Principle and working digital theodolite and its practice.

**4. Total Station, Auto Level And EDM :-** Working and application of total station, auto level and EDM. Various uses of total station in preparing drawings like drafting of elevation/vertical plane measurement of building.

**5. Curves:-** Simple circular curves:

- (i) Need and definition of a simple circular curve; Elements of simple circular curve, Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord, deflection angle, apex distance and mid-ordinate. Setting out of simple circular curve: (a) By linear measurements only:
  - Offsets from the tangents.
  - Successive bisection of arcs.
  - Offsets from the chord produced.

(b) By Tangential angles using a theodolite.

(ii) Transition Curves: Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curves; length of transition curves for roads by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only.

(iii) Vertical curves:- Setting out of a vertical curve.

**6. Geoinformatics Survey:** -Brief Introduction of G.P.S. surveying for making drawing of Site Plan, Contoured Plan, Digital Mapping, etc. and its practices, G.P.S., G.I.S. Remote Sensing.

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**III Year V Semester**  
**Field Surveying II (PRACTICALS)**

- Ex. (i) (a) Setting the plane table Plate-1.  
(b) Marking the North direction.  
(c) Plotting a few points by radiation method.
- Ex. (ii) (a) Orientation by Plate-1.  
- Trough compass  
- back sighting.  
(b) Plotting a few points by intersection method.
- Ex. (iii) Traversing an area with a plane table (at least five lines) Plate-1.
- Ex. (iv) (a) Two point problem. Plate-2.  
(b) Three point problem by  
- Tracing paper method.  
- Bessel's graphical method.  
- Trail and error method.

**Theodolite**

- Ex. (v) Drill for taking out the theodolite mounting on the tripod and placing it back in the box.
- Ex. (vi) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods.
- Ex. (vii) Traversing an area with a theodolite (at least five lines) and Plotting the traverse by calculating Latitude and Departure.
- Ex. (viii) Measurement of vertical angles by the use of theodolite.
- Ex. (ix) Measurement of Magnetic bearing of a line.
- Ex. (x) Prolonging a line.
- Ex. (xi) Running a closed traverse with a theodolite (at least five sides) and its plotting.

**Curves:**

- Ex. (xii) Setting out of a simple circular curve with given data by the following methods: Plate-1.  
(a) Offsets from main chord.  
(b) Offsets from the chords produced.  
(c) One theodolite method.
- Ex.(xiii) Setting out a circular curve with transition length by linear measurements. Plate-1.

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***III Year V Semester***

**DCE-506 IRRIGATION ENGINEERING**

**1. Introduction**

- 1.1 Definition of irrigation.
- 1.2 Necessity of irrigation
- 1.3 History of development of irrigation in India
- 1.4 Types of irrigation
- 1.5 Sources of irrigation water

**2. Rain Fall & Run - Off**

- 2.1 Definition of rainfall & run-off, catchment area, Dicken's & Ryve's formulae
- 2.2 Types of rain gauges - Automatic & Non - automatic
- 2.3 Stream gauging.

**3. Water Requirement of Crops**

- 3.1 Definition of crop season
- 3.2 Duty, Delta and Base Period, their relationship
- 3.3 Gross command area, culture able command area Intensity of Irrigation, Irrigable area
- 3.4 Water requirement of different crops-Kharif and Rabi

**4. Lift Irrigation**

- 4.1 Types of Wells - shallow & deep well, aquifer types, ground water flow, construction of open wells and tubewells.
- 4.2 Yield of an open/tube well and problems
- 4.4 Methods of lifting water - manual and mechanical devices, use of wind mills.

**5. Flow Irrigation**

- 5.1 Irrigation canals
- 5.2 Perennial Irrigation
- 5.3 Different Parts of irrigation canals and their functions
- 5.4 Sketches of different canal cross-sections
- 5.5 Classification of canals according to their alignment
- 5.6 Design of irrigation canals - Chezy's formula, Manning's formula, Kennedy's and Lacey's silt theory's and equations, comparison of above two silt theory's. Equations, critical velocity ratio.
- 5.7 Use of Garrets and Lacey's charts
- 5.8 Various types of canal lining - Advantages & disadvantages

## **6. Canal Head Works**

- 6.1 Definition, object, general layout, functions of different parts
- 6.2 Difference between Weir and Barrage

## **7. Regulatory Works**

- 7.1 Functions and explanation of terms used
- 7.2 Cross and Head regulators
- 7.3 Falls
- 7.4 Energy dissipaters
- 7.5 Outlets-Different types
- 7.6 Escapes

## **8. Cross Drainage Works**

- 8.1 Functions and necessity of the following types:- Aqueduct, Syphon, Super passage, Level crossing, inlet and outlet.
- 8.2 Constructional details of the above

## **9. Dams**

- 9.1 Earthen dams-types, causes of failure
- 9.2 Classification into masonry & concrete dams
- 9.3 Labeled cross-section of gravity dam.
- 9.4 Spillways

## **10. Water Logging and Drainage**

- 10.1 Definition, causes and effects, detection, prevention and remedies
- 10.2 Surface and sub-surface drains and their layout.

## **11. Major Irrigation Projects in India**

**Practice:-**Visits to at least one of the Irrigation Project and write specific report about the same.

## **12. Ground Water Recharge:-**Aim, Method and Advantage.

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***III Year VI Semester***

**DCE- 601 Environmental Pollution & Control**

- 1. ECOLOGY OF ENVIRONMENT:-** Elements of environment: Earth, water, air, space and energy. Ecology: Living and non living concept leading to ecology. Ecosystem: Terrestrial, aquatic and marine effect of environmental pollution on ecological balances.
- 2. POLLUTION AND ITS CLASSIFICATIONS:-** Definition, classification ,air,water,solid waste, thermal , noise and radioactive pollutions. Different parameter of pollution.
- 3. WATER POLLUTION:-**Sources , transport of pollutants,effect of water pollutants on man, animal ,plant and material,various types of pollutants.Mainly discuss various types of wastes from community, general characteristics of domestic & industrial wastes and their affects on environment, disposal methods on land and water, criteria of disposal by dilution. Stream sanitation. Sampling and monitoring instrumentation for water pollution and control.
- 4. AIR POLLUTION:-**Sources, types of air pollutants, Transport of air pollutants, dispersion by single and multile sources. Control equipment, filter, electrostatic precipitators, wet scrubbers, fume combustion by incineration. Air pollution control in new and old plants.
- 5. SOLID WASTE POLLUTION:-** Review of various types of solid waste.sources,components of solid waste,city garbage and industrial solid waste handling and disposal equipment . Method of disposal, salvage andrecovery. Volume reduction in solid waste.
- 6. NOISE POLLUTION:-**Sources,measurement of pollution. Degree of noise. Echos and their control. Industrial noise, units characteristics occupational injuries due to noise, criteria and standard for occupational injuries due to noise. Means to control noise in industry.
- 7. THERMAL POLLUTION:-**Various pollutants. Affects on environment, preventive measures.
- 8. RADIO ACTIVE POLLUTION:**Sources and affect on human, animals, plants and materials, measurement, means to control, preventive measures.
- 9. LEGISLATION :**Preliminary knowledge of the following Acts and rules made thereunder-
  - The Water (Prevention and Control of Pollution) Act - 1974.
  - The Air (Prevention and Control of Pollution) Act - 1981.
  - The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.

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**DCE-602 Design of Steel And Masonry Structures**

**1. Structural Steel and Sections**

- (i) Properties of structural steel as per IS:226 and IS:1977.
- (ii) Designation of structural steel sections as per IS Handbook and IS:800.

**2. Structural Steel Connections**

(i) **Riveted connections** - types of rivets, permissible stresses in rivets. Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints. Specification for riveted joints. Design of riveted joints for axially loaded members.

(ii) **Welded Connections:-** Comparison between riveted and welded joints, types of welds, permissible stresses in welds, types of welded connections, strength of welded joint, Design of welded joints for axially loaded members.

**3. Tension Members:-**Forms of common sections. Permissible Stresses in tension for steel. Strength of a tension member. Design of tension members (flats, angle & Tee Sections only). Tension splice and their design.

**4. Compression Members\_** Design of struts and columns as per IS:800. Effective length, slenderness ratio and permissible stresses, simple and built up sections, concept of lacings in built up columns.

**5. Beam-**Design criteria, allowable stresses, Design of laterally restrained beams including simple built-up sections. Checks for web bulking, web crippling and deflection.

**6. Column Bases:-** Column bases, design of simple column base

**7. Steel Roof Trusses:-** Different types of trusses, Loads on roof trusses. Various combination of loads to cause worst condition. Design of angle and tubular trusses (Tension and compression members), Design of purlins.

**8. Masonry and Foundation Structures-** Gravity masonry dams, retaining walls and chimneys



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***III Year VI Semester***  
**DCE-603 Construction Management, Accounts**  
**& Entrepreneurship Development**

**PART A : CONSTRUCTION MANAGEMENT**

**1. Introduction:**

- (i) Classification of construction into light, heavy and industrial construction.
- (ii) Stages in construction from conception to realization.
- (iii) The construction team: Owner, engineer and contractors , their functions and inter-relationship.
- (iv) Resources for construction industry; men, machines, materials, money and management.
- (v) Main objectives of Civil engineering & management.
- (vi) Functions of construction management, planning, organizing, staffing , directing, controlling and co-coordinating, meaning of each of these with respect to a construction job.

**2. Construction Planning**

- (i) Stages at which planning is done. Pre tender and contract planning by the contractor.
- (ii) Scheduling: Definition, Methods of scheduling: bar charts and CPM, advantages of scheduling. No problem on CPM to be set in the examination.
- (iii) Planning and scheduling of construction jobs by bar charts.
- (iv) Preparation of construction schedule, labour schedule, material schedule, and equipment schedule.
- (v) Limitations of bar charts.
- (vi) Cost-time balancing.

**3. Organization:**

- (i) Types of organization: Line, staff, functional and their characteristics.
- (ii) Principles of organization; (only meanings of the following and their significance);Span of control ; Delegation of authority and responsibility ; Ultimate authority and responsibility; Unity of command; contact; unity of assignment; job definition; increasing organization relationship.
- (iii) Motivation and human relationship concept, need and fundamentals.

**4. Site Organization:**

- (i) Factors influencing, job layout from site plan.
- (ii) Principle of storing and stacking materials at site.
- (iii) Location of equipment.
- (iv) Preparation of actual job layout for a building.
- (v) Organizing labor at site.

## **5. Construction Labor**

- (i) Conditions of construction workers in India, wages paid to workers.
- (ii) Trade unions connected with construction industry and trade Union Act.
- (iii) Labour welfare.
- (iv) Payment of wages Act. Minimum wages Act.
- (v) Workmen compensation Act.
- (vi) Contract Labor Act.

## **6. Control of Progress:**

- (i) Methods of recording progress.
- (ii) Analysis of progress.
- (iii) Taking corrective actions keeping head of office informed.

## **7. Inspection and Quality Control**

- (i) Principles of inspection.
- (ii) Major items in construction job requiring quality control.

## **8. Accidents and Safety in Construction:**

- (i) Accidents - causes.
- (ii) Safety measures for:
  - (a) Excavation work
  - (b) Drilling and blasting.
  - (c) Hot bituminous works.
  - (d) Scaffolding, ladders, form work.
  - (e) Demolitions.
- (iii) Safety campaign.

## **PART B : ACCOUNTS**

### **10. Introduction:**

- (i) Necessity of account.
- (ii) List of reference book on accounts:
  - (a) Civil Services Rules, Vol,I,II and III
  - (b) PWD Accounts codes.
  - (c) Manual of orders.
  - (d) Departmental financial rules.
  - (e) State Treasury rules.

### **11. Organisation**

- (i) Establishments in the PWD.
- (ii) Regular establishment:
  - (a) Permanent establishment.
  - (b) Temporary establishment.
- (iii) Work charged establishment.
- (iv) Contingency establishment.

## **12. Outline of P.W.D. System of Accounts:**

- (i) Necessity of a system of accounts.
- (ii) P.W.D. system of accounts.
- (iii) Classification of transactions:
  - (a) Necessity of maintaining the accounts by Head of Accounts:
  - (b) Heads of Account:
    - Major Heads.
    - Minor Heads.
    - Detailed Heads.

## **13. Cash**

- (i) Definition of cash.
- (ii) Precautions in custody of cash.
- (iii) Treasury challan -procedure to fill the prescribed form.
- (iv) Impress account and temporary advance.
- (v) Definition of imprest and rules for maintain in impress account. Actual filling of the prescribed form.
- (vi) Definition of temporary advance; Its difference from the imprest account ; maintenance of temporary advance account.

## **14. Stores:**

- (i) What are stores, their necessity and safe custody.
- (ii) Classification of Stores:
  - (a) Stores debatable to suspense heads-stock.
  - (b) Stores debatable to final heads: Tools and plant, Road metal, Material charged direct to works.
- (iii) Stock
  - (a) Kind of articles in stock
  - (b) Sources of stock receipt; Supplier, Other departments, divisions and sub- divisions Manufacturers.
  - (c) Sub heads of stock.
  - (d) Quantity accounts of stock.
  - (e) Return of monthly transaction of stock and half yearly return of stock.
  - (f) Stock taking of stores-general rules.
  - (g) Surpluses and shortages of stock-action for rectification of mistakes in stock accounts.
    - (h) Losses of stock-reporting the loss, estimates for loss of stock and writing off.
- (iv) Tools and Plants (T&P)
  - (a) Meaning.
  - (b) Classification of T&P
    - Register of T&P receipts and issues-Rules for actual filling of the prescribed form.
    - Statement of receipts and issues of T&P in prescribed form.
  - (c) Sources of receipt of T&P
  - (d) Authority of issue of T&P.
  - (e) Surpluses and shortage of T&P-reconciliation of accounts.

- (f) Points of difference in accounts of stock and T&P.
- (g) Disposal of unserviceable articles of T&P.  
Preparation of survey report in prescribed form.
- (v) Road Metal:
  - (a) Meaning.
  - (b) Rules for maintaining road metal returns-filling up the prescribed form.
  - (c) Method of checking.
  - (d) Shortages and surpluses.
- (vi) Materials charged direct to works:-Necessity, circumstance under which materials are directly charged to work.
  - (a) Material at site Accounts (M.A.S), Rules for actual filling of prescribed form i.e.
    - Detailed statement of materials compared with Estimated requirements
    - Report of the value and verification of unused materials.
  - (b) Disposal of surplus materials at the work site.
  - (c) Definition of:
    - Issue rate.
    - Storage rate.
    - Storage charges.
    - Supervision charges
    - Assets and liabilities.
- (viii) Issue of materials to contractors.

## 15. Works:

- (i) Categories:
  - (a) Original works.                      (b) Repair works.
- (ii) Classification of works according to cost
  - (a) Major works.                      (b) Minor works.                      (c) Petty works.
- (iii) Conditions to be fulfilled before a work can be taken in hand:
  - (a) Administrative approval.                      (b) Technical sanction.
  - (c) Appropriation of funds.                      (d) Expenditure sanction (for plan works)
- (iv) Methods of carrying out works:
  - (a) Departmentally through daily labor
  - (b) Through contractors
    - Piece work system - work order
    - Contract system - Agreement.
- (v) Different types of contract:
  - (a) Item rate contract.
    - Labor rate (%age above or below)for various items or for covered areas construction (Private construction only)
    - Through rate basis (%age above or below)

- (b) Lump-sum contract.
- (vi) Allotment of works:
  - (a) Concept of quotations and tenders
  - (b) Work order - Rules and Form.
- (vii) Definition of deposit works and Taccavi works.

## 16. Payment for Works:

- (i) Daily labor:
  - (a) Meaning.
  - (b) Muster roll.  
Rules.  
Instruction for maintenance. Three parts of M.R. - Nominal roll, unpaid wages, detail of work done and filling of prescribed form.
  - (c) Daily labor report, filling of prescribed form.
  - (d) Casual labor-Rolls Its difference from M.R.
  - (e) Mistakes of common occurrence.
- (ii) Payment of work charged establishment-  
preparation of pay bill on prescribed form.
- (iii) Payment to contractors and suppliers:
  - (a) Record of measurement.  
Measurement book (M.B.)  
General Instructions.  
Method of payment after measurements are recorded in M.B.  
Common mistakes in the use and maintenance of M.B.  
Student may be directed to record the measurement of different item such as W/w, Distemper, Painting, Glass fitting, Plastering, etc. for maintenance of a building.
  - (b) Check measurement Book (C.M.B.)  
Purpose, administration with regard to its maintenance.
  - (c) Standard measurement book (SMB)  
Purpose and instruction with regard to its maintenance.
- (iv) Different types of payment
  - (a) First and final payment.
  - (b) Running payment.  
Secured advance.  
On account payment.  
Advance payment.  
Running and final payment.
- (v) Hand receipt.
- (vi) Clause in which the detailed measurements are dispensed with.

## 7. Miscellaneous

- (i) Duties of Junior Engineer/S.O. and S.D.O.
- (ii) Instructions on transfer of charge.
- (iii) Maintenance of log books of vehicles and machinery.
- (iv) Manufacturers accounts and out turn of machinery.

- (v) Dealing with railways-booking of consignment, taking delivery, credit note, demurrage and wharf age charges and damaged consignment.

**NOTE:** Students will not be required to draw out and memorize the forms. They are expected to know only how to fill up the forms supplied for the purpose from the given data.

## **PART C : ENTREPRENEURSHIP DEVELOPMENT**

### **18. Introduction:**

Entrepreneur, entrepreneurship, its meaning & importance.  
Qualities of an entrepreneur. Entrepreneur Motivation Training.

### **19. Financing Agencies :**

Financial agencies for land, infra structure, machinery, raw material, import of raw material and machinery. Role and function of Govt. department connected with the development of industries/business ventures in the State.

### **20. Industrial Legislation and taxes:**

Industrial and labor laws, production tax, local tax, trade tax, excise duty and income tax.

### **21. Project Report:**

Component of project report - Land, building, electricity, water, equipment and other utilities. Materials, its availability, cost, labor availability and wage rates.  
Project report preparation, provisional registration and plan of acquiring finance from proper source (financing agencies).

## **PART D. INTELLECTUAL PROPERTY RIGHTS :**

Introduction to IPR (Patents, Copy Right, Trade Mark), Protection of undisclosed information, Concept and history of patents, Indian and International Patents Acts and Rules, Patentable and No patentable invention including product versus Process.

**Department of Civil Engineering**  
**(Faculty of Engineering & Technology)**  
**P.K. University, Shivpuri (MP)**  
**III Year VI Semester**  
**DCE-604 Civil Engineering Drawing-II**

**PART A : STEEL STRUCTURAL DRAWING**

1. Preparation of a working drawing (elevation ,plan ,details of joints at ridge, eaves and other connections) for a riveted steel roof truss resting on a masonry wall for the given span, shape of the truss and the design data regarding the size of the members and the connections. Also calculate the quantity of steel for the truss.
2. Tubular Steel Roof Trusses : Types of trusses for different spans. Details of column-truss connection. Simple truss using tubular sections. North light provision.
3. Steel connections (a,b,c,d) rivetted and (e) welded All unstiffened.
  - (a) Beam to beam connections (seated and framed)
  - (b) Beam to column (seated and framed)
  - (c) Column base connections (slab base & gusseted base)

**PART B : R.C.C. STRUCTURES( On Computer by AutoCAD)**

**a. PUBLIC BUILDING** :Plan elevation & sections of a public building like school ,hospital, canteen, community hall, guest house .at least double strayed showing details of following RCC elements:

- (i) R.C.C. beam singly reinforced and doubly reinforced giving the size and number of bars, stirrups their size and spacing.
- (ii) Details of reinforcement for a RCC square and circular column with isolated square footing.
- (iii) Details of reinforcement for a cantilever beam with given data regarding the size of the beam and the reinforcement. Anchorage of reinforcement.

**NOTE:-** 1.Bar bending schedules for each of the three above items will be prepared:

2. Details of reinforcement in plan and section for simply supported RCC. One way slab with intermediate support and two way slab. Bar bending schedule should be prepared.
3. Details of reinforcement of a two storeyed intennaland corner column. In this, the details of reinforcementat the junction with beams must be shown. Details of reinforcement of the junction of a secondary beam with the main beam with the given data.
- 4.i. Sectional details of T-beam showing details of bars
- ii. Details of reinforcement for cantilever retaining wall with the given design data regarding the reinforcement, size and shape of the wall.
- iii. Details of reinforcement in a simple circular overhead water tank.

**PART C : IRRIGATION ENGINEERING :**

- (i) Typical sections of a channel. Typical cross-section of an unlined and lined channel in cutting, partly cutting and fully in filling.
- (ii) Plan and cross-section of tube well with pump house.
- (iii) Plan, cross-section and L-section of a distributors fall with details of wing wall, pitching, flooring and tube-well.

**PART D :** Reading and interpreting Civil Engg. Drawing.

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**DCE- 605 EARTHQUAKE ENGINEERING**

1. Causes of earthquakes and seismic waves, magnitude, intensity and energy release, Basic terminology, Characteristics of earthquakes, Seismic hazard, vulnerability and risk, Seismic Zoning.
2. Earthquakes performance of structures in past earthquakes.
3. Philosophy of earthquake resistant design and concept of ductility, Short and long period structures, Concept of spectrum, Static force calculations.
4. Architectural considerations : Building simplicity, symmetry. Irregularities, Continuity and Uniformity
5. Effect of soils and liquefaction, Remedial measures, Construction of earth structures.
6. Seismic construction of masonry buildings, provisions of IS:4326.
7. Seismic construction of RC buildings detailing, provisions of IS: 13920.
8. Retrofitting of masonry and reinforced concrete buildings.

**9. DISASTER MANAGEMENT :**

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.



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**DCE- 607 PROJECT WORK**

**6.6.1 Preparation of any such project:**

- (i) Survey and soil investigation, planning, designing preparing working drawings, estimation and scheduling of a work for a small building including writing of Technical Report.
- (ii) Planning a water supply and drainage system for a house. Prepared of working drawings for all the sanitary fittings. Estimating quantity of materials and cost including writing of technical report.
- (iii) Preparation of water supply and drainage scheme for a small colony with all working drawings, estimates and schedule of works including writing of technical report.
- (iv) Given topographical sheet of the area, select alignment of a small length of road connecting tow stations. Preparation of detailed drawings (L-section, cross- section and plan). Detailed estimate, schedule of work and writing of technical report.
- (v) Selection of type design for a culvert to be proposed over a river let crossing a road. Preparation of working drawings, detailed estimate, schedule of wor and writing of technical report.
- (vi) Conducting survey, preparation of drawings, Estimate and writing technical report for the improvement and widening of an existing road.
- (vii) Conducting survey work, preparation of plans, making proposals for improvement, preparation of estimate for existing road including writing of technical report.
- (viii) Conducting survey work, preparation of plan, L-section and cross-section of a small distributor making proposals and preparing detailed estimates for earth work including writing of technical report.
- (ix) Conducting survey work of a depression, making proposals for bund working out capacity of reservoir and design of irrigation system including writing of technical report.
- (x) Planning of small civil engineering work including designs, drawings, estimates and technical report writing
- (xi) Other problem with in syllabus including survey work, design, drawing estimate and technical report writing.