

## EVALUATION SCHEME OF THREE YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (S F) – I YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Hours/ week			Sessional	Univ. exam	Total
			L	T	P			
1.	DEN-101	English	2	-	-	50	100	<b>150</b>
2.	DPH-102	Applied Physics	2	-	-	50	100	<b>150</b>
3.	DCH-103	Applied Chemistry	2	-	-	50	100	<b>150</b>
4.	DMA-104	Applied Mathematics – I	2	-	-	50	100	<b>150</b>
5.	DCE-105	Applied Mechanics	2	-	-	50	100	<b>150</b>
6.	DEE-105	Basic Electrical Engineering	2	-	-	50	100	<b>150</b>
7.	DME-107	Mechanical Engineering	2	-	-	50	100	<b>150</b>
8.	DME-108	Engineering Drawing	3	-	-	100	100	<b>200</b>
9.	DME-109	Workshop Technology	2	-	-	50	100	<b>150</b>
<b>Total</b>			<b>19</b>	<b>-</b>	<b>-</b>	<b>500</b>	<b>900</b>	<b>1400</b>

### PRACTICAL COURSES:

1.	DPH-112	Applied Physics	-	-	2	50	50	<b>100</b>
2.	DCH-113	Applied Chemistry	-	-	2	50	50	<b>100</b>
3.	DCE-115	Applied Mechanics	-	-	2	50	50	<b>100</b>
4.	DEE-115	Basic Electrical Engineering	-	-	2	50	50	<b>100</b>
5.	DME-117	Mechanical Engineering	-	-	2	50	50	<b>100</b>
6.	DME-119	Workshop Practice	-	-	3	50	50	<b>100</b>
<b>Total</b>			<b>-</b>	<b>-</b>	<b>13</b>	<b>300</b>	<b>300</b>	<b>600</b>
<b>Grand Total</b>			<b>-</b>	<b>-</b>	<b>32</b>	<b>800</b>	<b>1200</b>	<b>2000</b>

*Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.*

## EVALUATION SCHEME OF THREE YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (S F) – II YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Periods/ week			Sessional	Univ. exam	Total
			L	T	P			
1.	DCE-201	Building Construction	2	-	-	50	100	<b>150</b>
2.	DCE-202	Concrete Technology	2	-	-	50	100	<b>150</b>
3.	DCE-203	Construction Materials	2	-	-	50	100	<b>150</b>
4.	DCE-204	Theory of Structure	2	-	-	50	100	<b>150</b>
5.	DCE-205	Irrigation Engineering	2	-	-	50	100	<b>150</b>
6.	DCE-206	Surveying - I	2	-	-	50	100	<b>150</b>
7.	DCE-207	Engineering Drawing – I	2	-	-	100	100	<b>200</b>
8.	DCE-208	Hydraulics	2	-	-	50	100	<b>150</b>
9.	DCA-209	Computer Application	2	-	-	50	100	<b>150</b>
<b>Total</b>			<b>18</b>	<b>-</b>	<b>-</b>	<b>500</b>	<b>900</b>	<b>1400</b>

### PRACTICAL COURSES:

1.	DCE-211	Building Construction	-	-	2	50	50	<b>100</b>
2.	DCE-212	Concrete Technology	-	-	2	50	50	<b>100</b>
3.	DCE-214	Theory of Structure	-	-	2	50	50	<b>100</b>
4.	DCE-216	Surveying - I	-	-	2	50	50	<b>100</b>
5.	DCE-218	Hydraulics	-	-	2	50	50	<b>100</b>
6.	DCA-219	Computer Applications	-	-	2	50	50	<b>100</b>
<b>Total</b>			<b>-</b>	<b>-</b>	<b>12</b>	<b>300</b>	<b>300</b>	<b>600</b>
<b>Grand Total</b>			<b>-</b>	<b>-</b>	<b>30</b>	<b>800</b>	<b>1200</b>	<b>2000</b>

Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.

## EVALUATION SCHEME OF THREE –YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (S F) – III YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Periods/ week			Sessional	Univ. exam	Total
			L	T	P			
1.	DCE-301	Soil Mechanics & Foundation Engineering	2	-	-	50	100	<b>150</b>
2.	DCE-302	Estimating & Costing	2	-	-	50	100	<b>150</b>
3.	DCE-303	Design of R.C.C. Structures	2	-	-	50	100	<b>150</b>
4.	DCE-304	Design of Steel Structures	2	-	-	50	100	<b>150</b>
5.	DCE-305	Construction Management & Accounts	2	-	-	50	100	<b>150</b>
6.	DCE-306	Surveying – II	2	-	-	50	100	<b>150</b>
7.	DCE-307	Transportation Engineering	2	-	-	50	100	<b>150</b>
8.	DCE-308	Environmental Engineering	2	-	-	50	100	<b>150</b>
9.	DCE-309	Engineering Drawing - II	3	-	-	50	100	<b>150</b>
<b>Total</b>			<b>19</b>	<b>-</b>	<b>-</b>	<b>450</b>	<b>900</b>	<b>1350</b>

### PRACTICAL COURSES:

1.	DCE-311	Soil Mechanics & Foundation Engineering	-	-	2	50	50	<b>100</b>
2.	DCE-316	Surveying II & Camp	-	-	2	75	50	<b>125</b>
3.	DCE-317	Transportation Engineering	-	-	2	50	50	<b>100</b>
4.	DCE-318	Environmental Engineering	-	-	2	50	50	<b>100</b>
5.	DCE-320	Project	-	-	2	150	50	<b>200</b>
6.		Tour/Visits	-	-	-	25	-	<b>25</b>
<b>Total</b>			<b>-</b>	<b>-</b>	<b>10</b>	<b>400</b>	<b>250</b>	<b>650</b>
<b>Grand Total</b>			<b>-</b>	<b>-</b>	<b>29</b>	<b>850</b>	<b>1150</b>	<b>2000</b>

*Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.*

## EVALUATION SCHEME OF FOUR –YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (EVENING) – II YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Periods/ week	Sessional	Univ. exam	Total
1.	DME-107	Mechanical Engineering	2	50	100	<b>150</b>
2.	DME-109	Workshop Technology	2	50	100	<b>150</b>
3.	DCE-201	Building Construction	2	50	100	<b>150</b>
4.	DCE-203	Construction Materials	2	50	100	<b>150</b>
5.	DCE-204	Theory of Structures	2	50	100	<b>150</b>
6.	DCE-207	Engineering Drawing – I	3	100	100	<b>200</b>
7.	DCE-208	Hydraulics	2	50	100	<b>150</b>
<b>Total</b>			<b>15</b>	<b>400</b>	<b>700</b>	<b>1100</b>

### PRACTICAL COURSES:

1.	DME-117	Mechanical Engineering	2	50	50	<b>100</b>
2.	DME-119	Workshop Practice	2	50	50	<b>100</b>
3.	DCE-214	Theory of Structures	2	50	50	<b>100</b>
4.	DCE-218	Hydraulics	2	50	50	<b>100</b>
<b>Total</b>			<b>8</b>	<b>200</b>	<b>200</b>	<b>400</b>
<b>Grand Total</b>			<b>23</b>	<b>600</b>	<b>900</b>	<b>1500</b>

*Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.*

## EVALUATION SCHEME OF FOUR YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (EVENING) – III YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Periods/ week	Sessional	Univ. exam	Total
1.	DCE-202	Concrete Technology	2	50	100	<b>150</b>
2.	DCE-205	Irrigation Engineering	2	50	100	<b>200</b>
3.	DCE-206	Surveying – I	2	50	100	<b>150</b>
4.	DCA-209	Computer Application	2	50	100	<b>150</b>
5.	DCE-305	Construction Management & Accounts	2	50	100	<b>150</b>
6.	DCE-307	Transportation Engineering	2	50	100	<b>150</b>
7.	DCE-309	Engineering Drawing - II	3	100	100	<b>200</b>
<b>Total</b>			<b>15</b>	<b>400</b>	<b>700</b>	<b>1100</b>

### PRACTICAL COURSES:

1.	DCE-212	Concrete Technology	2	50	50	<b>100</b>
2.	DCE-216	Surveying – I	2	50	50	<b>100</b>
3.	DCA-219	Computer Application	2	50	50	<b>100</b>
4.	DCE-317	Transportation Engineering	2	50	50	<b>100</b>
<b>Total</b>			<b>8</b>	<b>200</b>	<b>200</b>	<b>400</b>
<b>Grand Total</b>			<b>23</b>	<b>600</b>	<b>900</b>	<b>1500</b>

Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.

## EVALUATION SCHEME OF FOUR YEAR DIPLOMA COURSE IN CIVIL ENGINEERING (EVENING) – IV YEAR

### THEORY COURSES:

S. No.	Course Code	Subjects	Periods/ week	Sessional	Univ. exam	Total
1.	DCE-301	Soil Mechanics & Foundation Engineering	2	50	100	<b>150</b>
2.	DCE-302	Estimating & Costing	2	50	100	<b>150</b>
3.	DCE-303	Design of R.C.C. Structures	2	50	100	<b>150</b>
4.	DCE-304	Design of Steel Structures	2	50	100	<b>150</b>
5.	DCE-306	Surveying – II	2	50	100	<b>150</b>
6.	DCE-308	Environmental Engineering	2	50	100	<b>150</b>
<b>Total</b>			<b>12</b>	<b>300</b>	<b>600</b>	<b>900</b>

### PRACTICAL COURSES:

1.	DCE-311	Soil Mechanics & Foundation Engineering	2	50	50	<b>100</b>
2.	DCE-316	Surveying – II	2	100	100	<b>200</b>
3.	DCE-318	Environmental Engineering	2	50	50	<b>100</b>
4.	DCE-320	Project	2	100	100	<b>200</b>
<b>Total</b>			<b>8</b>	<b>300</b>	<b>300</b>	<b>600</b>
<b>Grand Total</b>			<b>20</b>	<b>600</b>	<b>900</b>	<b>1500</b>

Note: In theory, there will be two sessional tests and one assignment accounted for the purpose of assessment in each year.

# ENGLISH DEN -101

"COMPLETE COURSE IN ENGLISH" by Robert J. Dixon

20 Marks

## CHAPTERS:

1. Two Thanks giving Day Gentlemen.
2. A Love Story.
3. The Gifts of Feoder Himkoff.
4. The Prince and The Judge.
5. Mr. Travers's First Hunt.
6. Portrait of a Teacher.

## COMPOSITON

- |                             |          |
|-----------------------------|----------|
| 1. Letter writing           | 10 Marks |
| 2. Technical Report         | 10 Marks |
| 3. Paragraph writing        | 10 Marks |
| 4. Construction of Dialogue | 20 Marks |

## GRAMMER

- |                                |          |
|--------------------------------|----------|
| 1. Direct to Indirect (speech) | 5 Marks  |
| 2. Change of Voice             | 5 Marks  |
| 3. Transfotrnation             | 5 Marks  |
| 4. Tenses                      | 5 Marks  |
| 5. Comprehension (Passage)     | 10 Marks |

# APPLIED PHYSICS

## DPH-102

### Unit – I

**Units and Dimensions:** Fundamental and derived Units (SI system), Dimensions of various physical quantities, uses of dimensional analysis and its limitations.

**Surface Tension :** Molecular forces, molecular theory of surface tension, surface energy, relation between surface tension and surface energy, angle of contact, shape of liquid surface in a capillary tube, rise of liquid in a capillary tube.

**Oscillations :** Periodic motion, simple harmonic motion (SHM), derivation of displacement, velocity, acceleration, time period and frequency; vibration of simple spring mass system (vertical and horizontal, two or more springs in series and parallel). Vibration of bodies supported on more than one identical springs.

### Unit – II

**Electrostatics :** Coulombs law, electric field, potential due to charge and number of charges, potential difference between two points, equipotential surface, electric field at a point due to a uniformly charged thin sheet, capacitor, capacitance of a parallel plate capacitor, energy stored in a capacitor, combination of capacitors (series and parallel).

**D.C. Circuits :** Kirchoff's law, Application of Kirchoff's law to the Wheat-Stone bridge, post office box, meter bridge and potentiometer. Heating effect of current, heat produced by electric current in a conductor and Joules law of electrical heating.

### Unit – III

**Electromagnetism :** Biot-Savart law, magnetic field around a current carrying conductor and at the center of a circular loop, force experienced by a moving charge and a current carrying conductor in a uniform magnetic field, forces between two parallel current carrying conductor definition of ampere, principle and working of a moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter.

### Unit – IV

**Temperature and its measurement :** Concept of heat and temperature, basic principle for temperature measurement, thermoelectric, platinum resistance thermometer and pyrometers.

**Expansions of solids :** Concept of linear ( $\alpha$ ), spherical ( $\beta$ ) & cubical ( $\gamma$ ) expansion, relations among ( $\alpha$ ,  $\beta$ , &  $\gamma$ ).

**Heat Transfer :** Modes of heat transfer, coefficient of thermal conductivity and its determination by Searl's and Lee's disc methods, thermal conduction through compound media.

**Optics :** Huygen's principle, reflection & refraction of a wave at a plane surface, refraction through a prism, lens formula, principle of working and magnifying power of telescopes and microscopes.

### Unit – V

**Modern Physics :** Atomic models: J.J. Thomson's model, Rutherford's model, Neils Bohr's Model and its shortcomings, X-rays production, properties and uses, lasers, types of lasers, study of the He-ne and Ruby lasers and their: properties and applications.

**Radioactivity :** Natural radioactivity, half life, average life, mass defect & binding energy, nuclear stability, fission, fusion, energy generated in reactors and radiation hazard.



# APPLIED CHEMISTRY

## DCH-103

### Unit – I

Problems based on volumetric and gravimetric analysis.

**Atomic Structure:** Fundamental particles, Bohr's theory of electrons. Quantum numbers, electronic configuration of first thirty-six elements.

**Electronic theory of valency:** Electrovalency and covalency.

**Polymerisation:** Addition and condensation polymerisation, thermoplastic and thermosetting, examples.

### Unit – II

**Water Treatment:** Hardness, Units of hardness, estimation of alkalinity, free chlorine, chloride ions, dissolved oxygen and hardness, softening processes of hard water, sedimentation, filtration and sterilization.

### Unit – III

**Fuels:** Classification of fuels, characteristics of good fuel, calorific value.

**Solid fuels:** Composition, properties and uses of peat, lignite bituminous & Anthracite.

**Liquid fuels: *Petroleum:*** brief idea of refining into fractions with their uses and characteristics.

**Gaseous fuels:** Preparation, Properties, composition and uses of coal gas, producer gas, water gas and oil gas. Advantages and disadvantages of liquid, gaseous fuels over solid fuels. Combustion of gaseous, liquid and solid fuels. Problems, Analysis of flue gases.

### Unit – IV

**Corrosion:** Its meaning, theory of corrosion, prevention of corrosion by various methods; metal and non-metal coatings.

**Lubrication:** Definition, theory and characteristics of lubricants (viscosity, viscosity index, oiliness, acid value and saponification value, cloud point, pourpoint, flash point and fire point). Effect of chemicals in lubricants, methods of lubrication.

### Unit – V

**Metals:** Physical properties of cast iron and the effect of impurities such as sulphur, silicon, phosphorous on it.

**Steel:** Steel, Effect of carbon, nickel, chromium and manganese on steel. Elementary knowledge of its heat treatment, hardening, tempering, annealing, normalizing and case hardening.

**Alloys:** Definitions, classification and necessity of making alloys. Composition, properties and uses of brass, bronze, duralumin, gun metal, invar.

# APPLIED MATHEMATICS -I

## DMA-104

### Unit-I

#### Algebra and Trigonometry

**Algebra:** Arithmetic progression, its  $n^{\text{th}}$  terms, sum to  $n$  terms. Geometric progression, its  $n^{\text{th}}$  term, sum to  $n$  terms and to infinity. Sum of the squares and cubes of finite natural numbers. Binomial theorem (without proof) for positive integral index (expansion and general term). Binomial theorem (without proof) for any index (expansion only). First, second Binomial approximation.

**Trigonometry:** Trigonometric ratios of sum and differences of two angles. Multiple and sub-multiple angles, simple trigonometric identities. Inverse trigonometric functions. Statement of cosine formula, sine formula, Napier's, half angle formula and its proof.

### Unit-II

**Coordinate Geometry :** Cartesian coordinates, polar coordinates and their conversion to Cartesian formula. Area of a triangle. Coordinates of the centroid and incenter of a triangle. Simple problems on locus. Equations of straight lines in various forms. Intersection of two straight lines and angle between them. Perpendicular distance formula. General equation of circle, determination of radius and center. Simple problems. Definition of conic section, standard equations of parabola, ellipse and hyperbola and their simple problems.

### Unit-III

**Differential Calculus :** Differential by first principle of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\log x$  and  $a^x$ . differential of sum, product and quotient function. Differential of function of a function, inverse trigonometric functions. Logarithmic differential. Successive Differentiation (excluding  $n^{\text{th}}$  order). Maxima and Minima. Equation of tangent and normal to a curve.

### Unit-IV

**Integral Calculus :** Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions. Evaluation of definite integrals, properties of definite integrals. Application of Gamma function on simple problems. Area of plain curves, Volume of simple solids of revolution.

### Unit-V

**Differential Equation and Vectors :** Order and degree of differential equations. Solution of differential equations of first order and first degree, variable separable. Homogeneous equations. Scalar and Vectors, addition and subtraction of vectors and their simple applications, multiplication of vector by a scalar. Scalar and Vector product of two vectors, Scalar triple product.

# APPLIED MECHANICS

## DCE-105

### Unit-I

**Introduction :** Concept of Mechanics and Applied Mechanics, Explanation of Mechanics and Applied Mechanics, its importance and necessity, giving suitable examples on bodies at rest and motion, explanation of branches of this subject. Concept of rigid bodies.

**Laws of forces :** Force and its effects. Units and measurement of force. Vector representation. Bow's notation. Types of forces, action and reaction, tension and thrust and shear force. Force system : coplanar, non-coplanar force systems. Free body diagrams. Resultant and components of forces. Concept of equilibrium. Parallelogram, Law of forces, equilibrium of two forces, super position and transmissibility of forces. Triangle of forces, different cases of concurrent coplanar two force systems, extension of parallelogram law and triangle law to many forces acting at one point. Polygon law of forces, method of resolution into orthogonal components for finding resultant, graphical methods.

### Unit-II

**Moments :** Concept of moment, Varignon's theorem' (statement only), Principle of moments – Application of moments to simple mechanism – Parallel forces, calculation of their resultant. Concept of couple-properties and effect, General cases of coplanar force system. General condition of equilibrium of bodies under coplanar forces, Lami's theorem.

**Center of Gravity and Moment of inertia :** Concept of gravity and center of gravity. Centroid for Day lamina and center of gravity for Day solids. Position of center of gravity of compound bodies and centroid of composite area. C.G. of reminders. Graphical determination of centroid. Concept of moment of inertia of Day bodies, rectangles and circles.

### Unit-III

**Motion:** Concept of displacement, speed, velocity, acceleration, vector representation of velocity and acceleration, composition and resolution of velocities, Uniformly accelerated motion. Derivation of equations of motion and their application, motion of freely falling bodies. Relative motion. Relative velocity.

**Laws of Motion:** concept of momentum, Newton's Laws of motion, their application, derivation of force equation from second law of motion. Numerical problems on second law of motion. Piles, lifts, bodies tied with string. Newton's third law of motion numerical problems. Conservation of momentum, impulse and impulse force.

### Unit-IV

**Work, Power & Energy:** Review of the concept of the work, power & energy. Types of energy, conservation of energy. Horse-power, work done against gravity and work done against friction. Problems pertaining to all types of energy including the nuclear energy.

**Circular motion:** Curvilinear motion, angular velocity and acceleration, derivation of equation for angular velocity, relation between angular and rectilinear motion, concept of torque and angular momentum, Centripital and centrifugal forces.

### Unit-V

**Simple Machines:** Concept of machine, mechanical advantage, velocity and efficiency of a machine, their relationship, law of machine, Simple machine (lever, wheel and axle, pulleys, jacks, winch crabs only). Concept of friction, laws of friction, limiting friction and coefficient of friction. Friction in machines.

Elasticity, stress, strain, Hook's law, Young's Modulus, Shear Modulus and Poisson's ratio elastic limit, Yield, Ultimate stress & breaking point.

# **BASIC ELECTRICAL ENGINEERING**

## **DEE-105**

### **Unit – I DC Circuit Analysis**

Concept of electricity, basic terms - voltage, current, potential difference, power, energy and their units. Ohm's law, factors affecting resistance of metallic conductors, resistance in series and parallel, series and parallel grouping of cells, Kirchhoff's current law and Kirchhoff's voltage law, simple numerical problems.

### **Unit – II AC Fundamental and AC Circuits**

Important terminology related to AC fundamentals, representation of sinusoidal quantities by phasors, phasor algebra, AC circuit containing pure resistance, pure inductance, pure capacitance & numerical problems.

RL, RC and RCL series and parallel circuits, series and parallel resonance, numerical problems.

### **Unit – III Network theorems**

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and their applications, conversion of circuits from star to delta and delta to star, numerical problems.

### **Unit – IV Supply Systems and Distribution Systems**

Supply system from pole to distribution box. Energy meter, main switch and distribution box, high and low voltage distribution system, Identification of 3 phase, neutral and earth wire on voltage distribution system.

### **Unit – V Domestic Installation & Safety measures**

Distribution between light and fan circuits and single phase circuit, sub-circuits. Various accessories and parts of installation, types of earthing, function of earthing, IE rules for electric installation & wiring, Common Safety.

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Reference book:

- ❖ Fundamental of Electrical Engineering by Ashfaq Husain
- ❖ Elements of Electrical Engineering by C R Dargan

# MECHANICAL ENGINEERING

## DME-107

### Unit – I

#### **Transmission of Power:**

Belt drive: Materials of belt, flat belt V-belt, open and cross belt drive, length of belt (without derivation), velocity ratio, slip, creep, angle of contact, derivation of tension ratio for flat & V-belt, Power transmitted through belts. Advantages of V-belt over flat belt. Simple numerical problems.

**Chain Drive:** Roller chain, silent chain, block chain, comparison between chain & belt drive.

**Pulleys:** Introduction, type & crowning of pulleys.

**Gears:** Spur, helical, bevel, spiral worm gears rack & pinion, Gear trains: Simple & Compound gears train and simple numerical problems.

### Unit – II

**Steam Generators:** Introduction, classification, Differentiation between fire tube and water tube boilers. Simple vertical boiler, Babcock & Wilcox boiler, Cochran boiler, Boiler accessories and mountings: Air preheater, super heater, economiser, steam separator, Fusible plug, pressure gauge, Feed check valve, steam stop valve, Blow of cock, water level indicator & safety valves.

**Turbines:** Introduction & classification of steam turbine: Impulse turbine: Simple impulse turbine, compounding of impulse turbines. Reaction turbines, comparison between impulse & reaction turbines, losses in steam turbine.

**Hydraulics turbine:** Classification, construction & working of Pelton wheel, Francis & Kaplan turbine.

### Unit – III

**I.C. Engines:** Classification of internal combustion Engines, Main parts of IC engines, Otto cycle, diesel cycle, spark ignition engines, compression ignition engines, working principle of 2-stroke and 4-stroke engines, ignition system of petrol engines i.e. battery & magneto ignition system, spark plug, Simple carburettor, working of solid fuel injection system of IC engines.

**Cooling System:** Necessity, Air Cooling & Water Cooling.

**Lubricants:** Introduction, Function of lubrication, method of lubrication: Petrol System, Splash system, pressure feed system, combined splash & pressure feed system.

### Unit – IV

**Pumps:** Working of reciprocating, centrifugal and gear pump, jet and submersible pump.

**Air Compressor:** Working of reciprocating type air compressor.

**Cranes:** Tower and bridge crane, Jaw Crushers, Hydraulic Jacks, Dump truck & hydraulic lift.

### Unit – V

**Refrigeration and Air Conditioning System:** Introduction, Performance of machine, Refrigerating machine, vapour compression cycle, simple vapour absorption cycle.

**Air Conditioning System:** Purpose of Air Conditioning, Factors affecting air conditioning, Evaporating cooling system in a desert country, window air conditioning.

# ENGINEERING DRAWING

## DME-108

### Unit – I

#### Basic Concepts

Introduction to Engg. Drawing, dimensions, lettering, use of drawing instruments, Drawing conventions as per IS: 696-1972 (revised). Scales: simple & diagonal symbols: Electrical, Electronics, Civil and Mechanical.

### Unit - II

#### Plane Geometry

Construction of plane geometrical figures, parabola, ellipse, hyperbola, cycloid, epi-cycloid, hypocycloid involute of base circle.

### Unit – III

Principle of projection. Orthographic projection of solids: Normal position and Inclined position. Development of surfaces of the simple solids, conversion of isometric pictorial projection to orthographic projection of simple objects. Isometric projection of solids and simple objects.

### Unit – IV

**Building Drawing:** Plan and elevation of a simple building.

**Machine Drawing:** Drawing and free hand sketches of machine components such as screwed fastening (nut & bolts) keys, knuckle, cotter and riveted joint. Some practice in blue print reading of assembly drawing.

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# WORKSHOP TECHNOLOGY

## DME-109

### Unit – I

**Carpentry Materials:** Timber, Classification of timber, Structure and defects, conversion and selection of timber, Seasoning and protection, plywood and its advantages, tools: Marking and measuring tools, Holding and supporting tools, Cutting tools, Planning tools, Striking tools, Boring tools and miscellaneous tools.

### Unit – II

**Fitting Materials:** Material for tools, Vices, V Block, Surface plate, Try square, Combination set, Files, Scrapers, Chisels, Hacksaw, Surface gauge, Universal surface gauge, Punches, Hammers, Callipers and Dividers.

### Unit – III

**Smithy:** Tools and equipments, Hammers, Sewage block, Anvil, Tongs, Chisels, Hardie, Gauges, Fullers, Flatters, Set Hammer, open fire and stock fire, Fuel and blowers. Processes forging, Upsetting, Welding, Defects in forging.

### Unit – IV

**Welding:** Types of welding, Arc welding and gas welding, Tools and equipment used in arc and gas welding, Types of flames, working pressure, Use of A.C. and D.C. Electrode, Soldering and brazing, precautions.

### Unit – V

**Metal Cutting:** Various metal cutting machine and operations (sawing sharing, plain turning, drilling, grinding and milling).

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# BUILDING CONSTRUCTION

## DCE-201

### Unit – I

Introduction: Definition of a building, classification of building based on occupancy. Different parts of a building.

**Foundation:** Factors affecting selection of foundations. Average bearing capacity of common soils. Types of foundations – Shallow and deep. Shallow foundations:- spread foundations for walls, masonry pillars and concrete columns, stepped foundations, raft foundation, grillage foundations, Design for the width, depth; and thickness of the concrete block. Pile foundations its suitability, classification of piles according to function. Classification of piles as per composition: timber, steel (pipe and sheet) and concrete (precast and cast in situ). Franki and simplex piles. Construction of foundations-preparing foundation plan, setting out of foundation plan on ground. Excavation, Timbering of foundation.. Precautions to be observed and the different methods adopted for laying foundation on black cotton soil.

**Walls:** Purpose of walls: Classification of walls-load bearing and non load bearing, classification of walls as per materials: concrete, precast hollow concrete block, R.C.C. and composite masonry walls. Brick masonry: definition of terms mortar, bond, facing, backing, hearting, columns, pillars, jambs, reveals, soffit, plinth, plinth masonry, brick, header, stretcher, bat, queen closer, king closer, beveled closer, frog and quoin. Bond meaning and necessity: types of bond and their suitability (English, Flemish, Header and stretcher). Sketches for 1, ½ Brick and 2 brick thick wall in English bond. T-junctions and right corner junctions. Sketches for 1, 1-1/2 and 2 brick square pillars in English Bond. 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, racking back and block bonding). Stone masonry; glossary of terms: natural bed, bedding planes string course, carbol, cornice. block-in-course, cramp. drip stone, propping. Types of Stone masonry: Rubble masonry: random and coursed, ashlar masonry: ashlar fine, ashlar rough, ashlar facing. Principles to be observed in construction of stone masonry walls.

Partition wall, constructional details, suitability and uses of brick and wooden partition walls. Mortars. preparation, use and average strength of cement, lime, lime cement, lime surkhi, lime mud mortar. Scaffolding constructional details and suitability of masons and tubular scaffolding. Shoring and underpinning: Types & uses. Safety in construction of low rise and high rise buildings.

### Unit - II

**Arches and Lintels:** Meaning and use of arches and lintels. Glossary of terms used in arches and lintels abutment, pier, arch ring, intrados, soffit, extrados, voussoiers, springer. springer line, crown, key stone, skew back, span, rise depth of an arch, haunch, spandril, jambs, bearing, thickness of lintels, effective span. Arches: Types of arches:

Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving. Stone arches and their construction: Brick arches and their construction. Construction of R.C.C. lintel (Precast and cast-in-situ)

**Doors and windows:** Glossary of terms used in doors and window. Doors: Names, uses and sketches of: ledged and battened door, ledged, battened and braced door, framed and panelled doors, glazed and panelled doors. Louvered doors, flush doors, revolving doors, PVC shutters, collapsible doors, rolling steel doors, side sliding doors. Doors frames (steel, timber and concrete). Window-names, uses and sketches of fully panelled window, fully glazed window, metal windows,casement,dormer window, clerestory/window, bay window



and ventilators, sky light window frames, windows of different material (steel, aluminium and wood).

### **Unit – III**

**Floors:** Ground floors, glossary of terms, floor finish, topping, under layer, rubble filling and their purpose. Types of floor finishes, Cast in situ concrete flooring (monolithic bonding), Terrazo tile flooring, Terrazo flooring. Timber flooring, PVC floor, ceramic floor description with sketches of the methods of construction of the floor and their specifications. Floor polishing equipments, Suspended floors (upper floors). Flooring on RCC slab, flooring on RB slab.

**Roofs:** Glossary for pitched roofs, batten, barge board, gable, hip, valley, rag bolt, . Types of roofs, concept of flat, pitched, hipped, arched and shell roofs. Simple steel roofs. Different types of steel roof trusses. Detail of steel roof connection including free and fixed. Roof covering in pitched roofs, Asbestos sheeting, big six, trafford sheets, Mangalore tiles, wooden singles. Method of arranging and fixing A.C. sheets. Drainage arrangement for pitched roofs. Flat roofs with arrangement of damp proofing and drainage.

### **Unit – IV**

**Damp Proofing:** Dampness and its ill effects on brick, plaster, wooden fixture metal fixtures and reinforcement. Damage of aesthetic appearance. Damage to stored articles and health. Sources of dampness-moisture penetrating the building from outside, e.g. rain water, surface water ground moisture. Moisture entrapped during construction e.g. moisture in concrete, masonry and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc. Damp proofing materials and their specifications: Rich concrete and mortar, bitumen felts, bitumen, mastic asphalt, plastic etc. Method of damp proofing basement ground floors, plinth and walls, special damp proofing arrangements in bath rooms. W.C. and kitchen, damp proofing for roof and window sills. Plinth protection and aprons.

**Stairs:** Glossary of terms, staircase, winders, landing, stringer, balustrade, riser, tread, width of staircase, handrail, nosing. Planning and layout of staircase. Relation 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 stairs.

### **Unit – V**

**Surface Finishes:** Plastering classification: grit finish, rough cost, pebble dash, plain plaster proportions of mortars used for different plasters, preparation of mortars, techniques of plastering and curing. Defects in plastering and repair work. Pointing – Different types of pointing, mortar used and method of pointing. Painting preparation and application of paint on wooden, steel and plastered wall surface, white washing, color washing, distempering. Application of cement and plastic paint. Commonly used water repellent for exterior surfaces: Their names and application. Ant termite treatment in building foundation, floors, wood work. Provision for expansion joints in buildings (foundation, floors, walls, roof, beams and slabs)

**Maintenance of building:** White and color washing. Distempering, cement painting. Painting a timber and steel surface. Replacement of glass panes. Repolishing of terrazo and mosaic flooring. Replacement of decayed timber and replacement of fittings. Easing of doors and windows. Repair of damaged part of flooring. Cleaning fire chimneys, gutters etc. Repair to worn out timber floor, polishing and waxing of timber floor. .

### **Building Planning:**

Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public buildings.

Basic principles of building planning, arrangement of doors, windows, cup boards etc for residential buildings.

Orientation of building as per BIS: 7662 in relation to sun and wind direction, rains, internal circulation and placement of room within the available area.

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# CONCRETE TECHNOLOGY

## DCE 202

### Unit – I

#### **Introduction:**

Definition of concrete, brief introduction to properties of concrete. Advantages of concrete. Uses of concrete in comparison to other building materials. Ingredients of concrete.

#### **Cement:**

Standard Portland cement, physical tests in respect of fineness, soundness, setting time, compressive and tensile strength. Chemical constituents of cement, theories of hardening, high early strength, heat of hydration, air entraining agents, aluminates cement.

### Unit – II

#### **Aggregates:**

Classification of aggregate according to source, size and shapes, characteristics of aggregates: particle size, shape, surface texture, specific gravity of aggregate, bulk density, water absorption, surface moisture, bulking of sand and deleterious material in aggregate. Grading of aggregate: coarse aggregate, fine aggregate, all in aggregate, Fineness modulus, interpretation of grading charts and combination of two or three sizes of aggregates to specific grading.

#### **Water”**

Limits on the impurities as per ISI specification, effect of excess impurities, ascertaining the suitability of water with the help of concrete cube test.

**Admixtures:** Acceleration, air entraining agents, water reducing & set controlling agents.

### Unit – III

#### **Preparation of Concrete:**

Proportioning of Ordinary Concrete, object of mix design, strength required for various grade from IS: 456. Preliminary Test. Works cube test. Proportioning for ordinary mix as prescribed by ISI and its interpretation. Adjustment on site for: Bulking, water content absorption, workability. Design data for moisture, bulking, absorption and suitable fine aggregate and coarse aggregate ratio. Difference between ordinary and controlled concrete operations.

#### **Storing:**

Cement: Storing of cement in the warehouses. Storing of cement at site.

Effects of storage on strength of cement. Determination of warehouse capacity for storage of cement.

Aggregates: Storing of aggregate on site for maintaining uniformity of moisture and cleanness.

#### **Batching:**

Batching of cement. Batching of aggregate by volume using gauge box, selection of proper gauge box. Batching by weight: spring balances and by batching machines. Measurement of water.

#### **Mixing:**

Hand mixing. Machine mixing. Type of mixtures, capacity of mixers, choosing appropriate size of mixer, operation of mixer. Maintenance and care of machines, transportation of concrete. Transportation with and situation of use of the following: pans, wheel burrows, truck mixer, chutes, belt conveyors, pump, tower crane and hoist etc.

#### **Placement of Concrete:**

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, and

checking of form work, checking provisions of joint. Placement of concrete precautions to be taken.

**Compaction:**

Hand compaction: pavement, narrow and deep members. Machine compaction-types of vibrators (Internal screed vibrators and form vibrators). Methods of handling screed vibrators and immersion vibrators. Suitability of concrete mixes for compaction with vibrators. Selection of suitable vibrators for various situations.

**Finishing Concrete slabs:**

Screeding, floating and trowelling.

**Curing:**

Object of curing. Methods of curing, shading concrete works, covering surfaces with hessian, gunny bags, sprinkling of water, ponding method, membrane curing and steam curing. Recommended duration for curing and removal of form work.

**Unit – IV**

**Properties of Concrete:**

Properties in plastic stage, workability, segregation, bleeding.

**Properties of hardened Concrete:**

Strength, durability, impermeability, dimensional changes.

**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. Relation between water cement ratio and strength. Present trend and CRRI chart.

**Workability:**

Definition, Phenomenon of workability. Concept of internal friction, segregation and harshness. Factor affecting workability: Water content, shape, size and percentage of fines passing 300 micron. Measurement of workability: Slump test, compaction factor test. Recommended slumps of various conditions for placement.

**Unit - V**

**Hot Weather Concreting:**

Effect of high temperature on concrete strength, cooling of concrete materials, precautions before during and after concreting. Use of retarders.

**Cold Water Concreting:**

Effect of low temperature on concrete strength. Heating of concrete materials, precautions before during and after concreting. Use of accelerations.

**Jointing:**

Location of construction joints, treatment of construction joints before the concrete is poured. Concreting at these joints, expansion joints in concrete – their importance and location in buildings.

**Quality Control of site:**

Control tests and its frequency on cement, aggregates, water and concrete.

**Repair and Maintenance:**

Methods of repairing new and old concrete work for cracks and holes. Dry pack method and replacement of concrete method, procedure for mortar replacement, curing of repair works, periodical, Treatment for protection against weathering.

# CONSTRUCTION MATERIALS

## DCE 203

### Unit – I

#### **Building Stones:**

Classification of Rocks: (Brief review only). Geological classification: Igneous, sedimentary and metamorphic rocks. Chemical classification; Calcareous, argillaceous and siliceous rocks. Physical classification: Unstratified, stratified and foliated rocks. General characteristics of stones. Requirements of good building stones and their testing. Identification of common building stones. Various uses of stones in construction.

### Unit - II

Introduction to bricks: Raw materials for brick manufacturing and properties of good brick making earth. **Manufacturing of bricks.** Preparation of clay (manual/mechanically).

**Moulding:** Hand moulding and machine moulding, hand moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-flyash bricks, sun dried bricks. Classification of bricks as per BIS: 1077. Size of brick – IS specification, commercial sizes. Testing of common building bricks as per BIS: 3495. Compressive strength, water absorption, efflorescence, dimensional tolerance test. Special Bricks. Building tiles; types of tiles: wall, ceiling, roofing and flooring tiles. Ceramic tiles, their properties and uses. Stacking of bricks and tiles at site.

### Unit – III

**Cement:** Introduction, raw materials, manufacture of ordinary Portland cement, flow diagram for wet and dry process. Properties and uses of ordinary Portland cement. Testing of cement as per BIS: Strength of cement, fineness by sieving, consistency, soundness, setting times. Special Cements and their uses. Storage of Cement.

**Lime:** Introduction: Lime as one of the cementing materials. Natural sources for the manufacture of lime. Definition of terms; quick lime, fat lime, hydraulics. Calcination and slaking of lime. IS classification of lime. Testing of lime.

### Unit – IV

**Timber and Wood Based Products:** Classification of trees: Exogenous and endogenous trees, cross-section of an exogenous tree and explanation of various terms. Identification of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail and Chir. Market forms of converted timber as per BIS. Seasoning of timber: Purpose, methods of seasoning, kiln seasoning as per BIS. Defects in timber, decay in timber. Preservation of timber and methods of treatment as per BIS. Properties of timber and specification of structural timber. Common structural timbers in India, their availability and uses-Teak, Deodar, Chir, Kail, Shisham, Sal and Mango, Plywood; Veneers and veneering, manufacturing plywood (brief description only), uses of plywood. Other wood based products, their brief description of manufacture and uses: laminated board, block board, fibre board, hard board and gypsum board, applications of boards in false ceiling and wall paneling.

**Paints and Varnishes:** Purpose and use of paints. Different types of paints: oil paints, water paints and cement paints. Oil paints: Constituents of an oil paint, raw materials used for different constituents of oil paints and their properties, preparation of an oil paint, characteristics of a good oil paint. Application on wood and metal surfaces.

**Cement Paints:** Commonly available cement paints, their properties and uses. Application of cement paints. Varnishes and polish types, properties and their uses. Lacquers and enamels- their properties and uses.

### Unit – V

**Metals:** Ferrous metals: Composition, properties and uses of cast iron, steel (mild and high tension steel), requirements of mild steel as per BIS. Non Ferrous: Properties and uses of the following non ferrous metals in Civil Engineering works – copper, lead, zinc, tin and aluminium. Commercial forms of ferrous and non ferrous metals.

**Miscellaneous Materials:**

**Plastics:** Important commercial products of plastics used in Civil Engineering construction.

Asbestos based products: Commercial forms and their uses. Insulating materials for sound and thermal insulation . Geo-textiles. Construction chemicals like: water proofing components, epoxies, sulphides, polymers.

**Glass:** Types of glasses, their properties, commercial forms and uses: plate glass, wired glass, bullet resisting glass, colored glass, fibre glass, foamed glass, glass wool, float glass, glass reinforced plastic.

Water proofing materials: Bitumen sheets and felts, chemical admixtures. Composite materials.

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# THEORY OF STRUCTURE

## DCE 204

### Unit – I

**Simple Stresses and strains:** concept of various types of stresses and strains (Tensile compressive, shear, bending and torsional). Direct stresses and strains: Tensile, compressive and shear (for uniform sections). Elasticity, Hooke's Law. Load deformation diagram (for mild steel). Definition of modulus of elasticity and modulus of rigidity, temperature stresses and strains for homogeneous materials. Elastic constants and their relationship. Resilience and impact.

**Shear force and bending moment:** Concept of beam and supports (hinged, roller and fixed) Types of Beam: simply supported, cantilever, fixed and continuous beams. Types of loads: Distributed, point and varying. Concept of bending moments and shear force, sign conventions, bending moment and shear force diagrams for cantilever, simply supported and over hanging beams subjected to UDL, point load and uniformly varying loads. Relationship between load, shear force and bending moments. Points of maximum B.M. and point of contra flexure.

### Unit – II

Bending Stresses;  $M/I = f/y = E/R$

Moment of resistance, section modulus and permissible bending stress, bending stresses in circular, rectangular I, T and L sections. Comparison of strength of these sections flitched beams. Shear stress distributions in rectangular. I and T sections (Formula to be stated – No derivation).

Combined direct and bending stresses; Eccentricity, effect of eccentric load on the sections. Stresses due to eccentric loads. Simple cases of short columns. Chimneys and Dams. Rankin's formula for earth pressure (No derivation) analysis of retaining walls with out surcharge.

### Unit – III

Slopes and deflection of beams: Importance of calculating slopes and deflection of a beam slopes and deflection in the following cases:

- i) Simply supported beams with UDL and point loads.
- ii) Cantilevers with UDL and point loads.

Simple Columns and Struts: Concept of long and short columns and slenderness ratio use of ISI formula and other simple formulae.

### Unit – IV

Analysis of trusses; force in simple trusses due to dead load and wind load by the methods of joints and sections.

Torsion; Concept of torsion with the help of equation  $T/J = fs/R = C\theta/L$  Stress and strain in pure torsion only.

### Unit – V

Degree of Indeterminacy; (i) Propped cantilevers (ii) Fixed beams (iii) Continuous beams by the methods of (1) Theory of three moments and (2) Moment distribution method (No derivation). Simple idea (No derivation of rigid structures).

# IRRIGATION ENGINEERING

## DCE –205

**Introduction:** Necessity and scope, advantages and disadvantages of irrigation.

**Hydrology:** Definition hydrology and its use in engineering, hydrological cycles, unit hydrograph, rainfall and its measurement by rain gauges, run-off catchment, factors affecting run off.

**Water Requirement of Crops:** Crops and their classification, duty of water, common definitions, crop period, base period, delta and their mutual relationship. Determination of water requirement of irrigation channels, commanded areas.

### Unit – II

**Flow irrigation:** Introduction, components and systems.

**Storage:** Dams, rock-fill, masonry, gravity, Elementary idea (with sketches). Glossary of terms used in dams, catchment area, spillways, gates and sluices, selection of site and type in case of dams, Flow net diagram of earthen dams. Stability of dams, Elementary content of seismic forces, silting of reservoirs.

### Unit – III

**Distribution:** Classification, perennial and non-perennial canals, canal alignment, layout of canal system. Main canal, branch canal, distributaries and minors, water courses, typical cross-sections of main canal in embankment in cutting and in partial cutting and partial embankment. Canal lining, necessity for types of canal linings, maintenance of irrigation canals, canal breaches and their repairs. Silt removal.

**Silt Theories:** Kennedy and Lacey's theories, affecting design of channels, regime conditions of irrigation channels, Flow equations, latest concepts.

**Water Logging:** Definition, causes and effects, prevention and remedial measures.

### Unit – IV

**River Training Works:** River origins and their characteristics. Classification of rivers on alluvial plains, meandering, regime conditions, critical velocity, river training works, functions and types of river training works, marginal embankment, guide banks, groynes, river bank revetments, pitched islands, cut offs.

**Headworks:** Function of headworks, its location, layout and constituent parts, weirs, scouring sluices, divide wall, fish ladder, silt excluder and ejector, Head regulator, causes of failure of weirs on permeable foundations. Hydraulic jump, types of weirs and barrages.

**Cross drainage works:** Functions and necessity of aqueducts, super passage, level crossing.

**Regulatory works and falls:** Function, explanation of the terms used, constructional and functional details of regular, Falls; definition, function and types detailed description of Sarda and flume type of falls, rapids, escapes, outlets, gauge wells.

### Unit – V

**Well and lift irrigation:** Occurrence of ground water, location and tube wells, comparison of deep and shallow open wells, constructional details and their yields, Broad classification of irrigation tube wells. Technical terms radius of influence, depression head, cone of depression, interference of wells. Yield of tube wells, strainers, methods of construction and boring, boring log, installation of suitable pumps, typical cross-section of tube well, Methods of lifting water.



# SURVEYING – I

## DCE – 206

### **Unit – I**

Introduction: Concept and purpose of surveying, plane and geodetic surveys, linear and angular measurements used of the purpose. Classification of surveys based on instruments used. Basic principles of surveying.

Chain surveying: principle and suitability, equipment used (with construction details as per IS code). Direct and indirect ranging, chaining on flat and sloping ground. Reconnaissance, selection of stations and plotting a chain survey of about 4 hectares. Testing, maintenance and adjustments of chains and tapes, optical square and line ranger. Obstacle in chaining. Obstacles and erroneous length of chain. Permissible errors in chaining.

### **Unit – II**

Compass: Principle and suitability. Concept of bearing, systems of bearings, constructional details, working and use of prismatic compass, magnetic dip, declination and local attraction. Open and closed traverse, chain and compass traversing, graphical adjustment of closing errors. Errors in compass surveying. Limits of accuracy with reference to pure chain triangulation. Testing and adjustment of compass.

### **Unit – III**

Plane Table Surveying: Suitability of plane table surveying vis-a-vis other methods of surveying. Plane table surveying equipments including telescopic alidade. Plane table operations, various terms used and methods of plane tabling. Two points and three points problems. Errors in plane table survey and their relative importance, precautions to ensure accuracy. Accuracy and limits of errors. Plane table survey in combination with other instruments and method of surveying. Testing and adjustment of plane table and its accessories. Use of tangent clinometers.

### **Unit – IV**

Leveling: Concept and explanation of all terms connected with leveling work, Principle and construction details of surveying telescope. Theory of leveling, Dumpy, Tilting and Quickset level. Types of leveling staves. Reduction of levels and maintenance of level field book, numerical problems, including problems on missing entries. Effect of earth curvature and refraction. Errors in Leveling, precautions to ensure accuracy. Fly, check and profile leveling reciprocal leveling. Difficulties in leveling. Permissible limits of errors.

### **Unit – V**

Instruments: Constructional details, method of using, testing and adjusting (i) Abney Level (ii) Cylons' Ghat tracer (iii) Box Sextant (iv) Nautical Sextants. Permanent adjustment of Dumpy and tilting levels.

Calculation of areas, trapezoidal and Simpson's rules with numerical problems. Use of planimeter and pantagraph.

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# ENGINEERING DRAWING – I

## DCE 207

### **Unit - I**

Drawing of building from line plans and specifications with its plan, section and elevation.

### **Unit – II**

Detailed drawing of brick and stone masonry. Drawing of wooden doors and windows and steel windows. Corrugated iron sheets and asbestos sheets used for roof covering, detailed cross-section of floorings as per ISI specifications.

### **Unit – III**

Septic tank and soak pit. Bathroom and W.C. connections-showing position of wash basin tap/shower etc. Wooden roof trusses resting on masonry.

### **Unit – IV**

Working drawing of two storyed buildings showing plan elevation cross section etc.

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# HYDRAULICS

## DCE –208

### Unit – I

Introduction: Definition of fluid, fluid mechanics and hydraulics. Hydrostatics, Hydro kinematics and Hydrodynamics.

Physical properties of liquids; specific weight, density specific gravity, viscosity, vapour pressure, cohesion, surface tension, capillarity and viscosity, compressibility (description), units of measurement.

Hydrostatic pressure; Pressure, intensity of pressure, pressure head, Pascal's law and its application such as hydraulic press. Total pressure, resultant pressure and center of pressure, total pressure and center of pressure on vertical and inclined plane surfaces (a) rectangular (b) triangular (c) trapezoidal (d) circular. Engineering applications; such as walls, dams and gates (sluice and lock). Pressure and center of pressure on curved circular surfaces (numerical involving quadrants only).

Measurement of pressure: Atmospheric pressure, gauge, vacuum and absolute pressure, piezometer tube, simple manometers, differential manometers, mechanical gauge, Bourdon gauge.

### Unit – II

Fundamental of fluid flow: Types of flow (a) steady and unsteady (b) laminar and turbulent (c) uniform and non-uniform, discharge and continuity equation. Types of hydraulic energy (a) potential energy (b) pressure energy (c) Kinetic energy, Bernoulli's theorem, statement and description (without proof of theorem). Venturimeter (Horizontal and inclined). Orifice-meter

Orifices: Definition of orifice and type, hydraulic coefficients, small and large vertical rectangular orifice, free drowned and partially drowned orifice. Time of emptying a rectangular/circular tank with flat bottom.

### Unit - III

Flow through pipes: Definitions, Laminar and turbulent flow explained through Raynold's experiment. Raynold's number, critical velocity and velocity distribution. Losses in pipe lines due to friction, sudden expansion and sudden contraction, entrance exists, obstruction, and change of direction (no derivation needed). Hydraulic gradient line and total energy line. Flow from one reservoir to another through a long pipe of uniform and composite section.. Water hammer phenomenon and its effect (only elementary treatment). Pipes in series and parallel.

**Flow through open channels:** Definition of channels, concept of uniform and non-uniform flow. Discharge through channels, using (a) Chezy's formula (no derivation) (b) Manning's formula. (Note: The Chezy's coefficient may be determined, using Kutter's or Bazin's formula, which will be supplied). Most economical sections (a) rectangular (b) trapezoidal (c) Circular.

### Unit – IV

**Flow Measurements:** Measurements of velocity by (a) floats (b) velocity rod (c) Pitot tube (d) current meter (Discharge computations by simple segment method), measurement of discharge.

**Notches:** Difference between notch and orifice, Types of notches (rectangular, triangular and trapezoidal) conditions for their use and their discharge formula (without derivation).

**Weirs:** Difference between notch and weir. Discharge formula for free, drowned cippoletti weir, broad crusted weir with and without end contractions. Velocity of approach and

conditions for their use. Ventilation of weirs. Ogee weir, venturi flumes, spillway and siphon spillway.

**Unit – V**

**Pumps and Turbines:** Definitions of a pump, centrifugal and reciprocating pumps, principle of working and installations, selection of these pumps for different situations. Hydraulic Ram. Definition of a turbine. Reaction and impulse turbine. Principle of working of pelton wheel, Francis and Kaplan, turbines and selection of turbines for different situations.

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# COMPUTER APPLICATION

## DCA-209

### Unit – I

#### **Introduction:**

Digital computer, Brief History, Computer Generations, Types of computers & their classification, PC family, Application of computer in office automation, Science & Engineering, Hardware & Software system, Basic computer organization, Basic concept of data & information. Number systems, Decimal & Binary number systems, Data representation –Fixed point & floating point number representation. Introduction to networking, various types of network, software & Hardware, Internet.

### Unit – II

#### **Operating System & PC Softwares:**

Basic concepts & functions of an operating system, Disk operating systems, MSDOS, Directories & Files, Commands & Utilities, Batch file programming, Management of computer resources like Memory, CPU, I/O, Storage Computer Virus and protection, Familiarization with Windows structure & use. Working knowledge of PC Software Word processor, Spreadsheet, Database.

### Unit – III

#### **Numerical Analysis & Programming Techniques:**

Numerical Analysis – Iteration methods; Newton - Raphson method, Bisection method Algorithm, Pseudo-codes, Flow charting – rules & symbols, Structured programming concept, Computer Language – Low level, High level & 4 Gls, Compilers, Interpreters, Object oriented programming, Need & Characteristics, Inheritance, Reusability, Polymorphism, Overloading.

### Unit – IV

#### **C/C++ Programming**

C/C++ - preliminaries Data types, operators, Expressions, Input/Output, Functions and program structure, Program control flow, looping, Arrays, String, Pointers, Structures, Unions, File handling, Functions & Pre-processor commands, Graphics functions, Common programming errors, Classes.

### Unit – V

#### **Computer Graphics:**

Introduction to Computer graphics, Graphics primitives, Computer aided drafting & design (CADD), Various CADD packages, Auto-CAD, Simple engineering drawing using auto-CADD, Graphic Function in C.

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# SOIL MECHANICS & FOUNDATION ENGINEERING

## DCE-301

### Unit – I

**Introduction:** Importance of soil studies in Civil Engg. Geological origin of soil with special reference to soil profiles in India: Residual and transported soils, alluvial deposits, lake deposits, Dunes and Loess, Glacial deposits, conditions in which above deposits are formed and their engineering, characteristics.

**Soils Classification and identification:** Mineralogical composition, particle size and shape and their effect on engineering properties of soil. Gradation and its influence on engineering properties. Relative density and its use in describing cohesion less soils. Behavior of cohesive soils with change in water content, Atterberg definitions, use and practical significance. Classification systems, basic symbols, major divisions, groups, plasticity chart, procedure to be followed in classifying a given soil into a group. HRB soils classification system, basic symbols procedure to classify a given soil and textural classification.

**Saturated and partially saturated soils:** Constituents of soils, phase diagram for soil. Definition and meaning of void ratio, porosity, degree of saturations, water content, specific gravity of soil grains, unit weights. Typical values of the above with simple inter relationship among them.

### Unit – II

**Effective Stress:** Stresses in sub soil. Definition and meaning of total stress, effective stress and neutral stress. Principle of effective stress. Importance of effective stress in Engineering problems.

**Flow of water through soils:** Darcy's law, Co-efficient of permeability and its determination by field and lab methods, discharge velocity and seepage velocity, typical values of coefficient of permeability of different types of soils.

### Unit – III

**Deformation of soils:** Meaning, conditions/situations of occurrence with emphasis of practical significance of (i) Consolidation and consolidation settlement (ii) Creep (iii) Plastic flow (iv) Heaving (v) Lateral movement, definition and practical significance of compression index, normally consolidated soil, pre consolidated soil, excess pore pressure. Meaning of total settlement uniform and differential settlement and rate of settlement and their importance. Settlement due to construction operations and lowering of water table. Effect of settlement on structures, tolerable settlement for different structures. Vertical stress distribution in the soil due to foundation loads.

### Unit – IV

**Strength Characteristics of soils:** Example of shear failure in soils. Factors contributing to shear strength of soils. Coulomb's law. Two dimensional stress analysis by Mohr's stress circle and its application on soils. Determination of shearing strength. Direct shear test and unconfined compression test. Conditions of test and their significance. A brief idea about Triaxial compression. Strength and strain curve, peak strength and ultimate strength, their significance. Discrepancies between laboratory and field test.

**Soil Compaction:** Definition of compaction and its necessity. Laboratory compaction test, definition and importance of optimum water content, maximum dry density, relations for typical soils with different comp active efforts. Field compaction: Methods and equipments, choice of equipment. Compaction requirements, compaction control, density control. Field density test, (sand replacement) Moisture control, Proctor's needle and its use, thickness control.

### Unit – V

**Application of soil mechanics – principles to Civil Engg. Problems:**

Definitions and types of shallow and deep foundations. Concept of bearing capacity. Definition and significance of ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Bearing capacity from building codes. Terzaghi's bearing capacity formula and factors affecting bearing capacity. Bearing capacity by S.P.T and plate load test. Brief description about factors affecting depth of foundation; deep foundations, types of piles and their suitability, load carrying capacity of soil, construction features of pile foundations, soil properties governing choice of foundation type, stability of embankments and earth dams. Basic principles in the design of supports to retain earth.

**Soil Exploration:** Purpose and scope of soil exploration. Undertaking planning of sub surface investigation. Influence of soil conditions on exploratory program. Influence of size of project and type of structure on exploratory program. Possibility of mis-adjustment of sub soil conditions. Location, depth and spacing of explorations. Methods of soils exploration: Reconnaissance, field identification of soil. Trial pits, Borings (Auger, wash Rotary, discussion to be briefly dealt), S.P.T. and dynamic cone penetration test (brief description and information collected). Ground water level measurement. Sampling, undisturbed, disturbed and representative samples, selection of type of sampler, thick, thin wall and piston sampler. Area ratio, recovery ratio of samples and their significance, number and quantity of samples, Labeling, sealing and preservation of samples, presentation of soil investigation results.

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# ESTIMATING AND COSTING

## DCE-302

### Unit – I

Introduction to estimating. Types of estimates, drawings to be attached with these estimates. Different methods of taking out quantities. Center line in to in and out to out, methods. Taking quantities for walls of different shape: Straight, T,H,U, segment of a circle, Hexagonal. Various forms used in estimating measurements, abstract of cost and material statement. Quantities for masonry in a boundary wall consisting of pillars with unequal depth of foundation.

Units of measurement and units of payment of different items of work.

### Unit – II

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 and a pitched roof. Estimate for providing a door in place of a window existing in a wall.

### Unit – III

Analysis of rates: Steps in the analysis of rates for any item of work, requirement of materials for: Plain cement concrete of different properties, Brick and stone masonry in cement and lime mortar, plastering and pointing with cement mortar in different proportions, white washing. Analysis of rates of following items of works when rates regarding labor and materials are given. Earthwork in excavation and filling with a concept of lead and lift cement concrete in foundation, RCC in roof slabs, Brick masonry in cement mortar, RR stone masonry in cement mortar, cement plaster, cement pointing, white washing on a new surface and old surface, painting on new wood work, cement concrete flooring, paneled and glazed door. Calculation of quantity of steel in RCC slabs, lintels, columns, stairs and retaining walls with the help of drawings.

### Unit – IV

Calculation of earthwork for a portion of road using the following methods: Average depth, Average cross section area. Prismoidal formula. Calculation of earthwork in roads in plains and hills from given drawings.

Calculation of earthwork for unlined irrigation channels with the help of drawings for different cross-sections.

Detailed estimate for a signal span slab culver with different types of wing walls.

### Unit – V

Public Health: Preparation of detailed estimate for a septic tank and soak pit. Preparation of detailed estimate for a sewer. Preparation of detailed estimate for laying in a water supply line (C.I. pipe). Preparation of detailed estimate for sanitary and water supply fittings in domestic building containing one set of toilets.

Valuation: purpose of valuation, principle of valuation. Definition of terms such as depreciation, sinking fund, salvage and scrap value. Valuation of a building property by replacement cost method and rental return method. Calculation of standard rent.



# DESIGN OF R.C.C. STRUCTURES

## DCE-303

**Introduction:** Concept of R.C.C.

**Reinforcing materials:** Various types of reinforcing materials. Suitability of steel as a reinforcing materials. Properties of different types of steel (mild steel, medium tensile steel and deformed bars).

**Theory of R.C.C. Beams:** Assumption in the theory of simple bending for RCC beam. Flexural strength of singly reinforced RCC beam. Position of the neutral axis. Resisting moment of the section, critical neutral axis. Concept of balanced under reinforced and over reinforced sections. Shear strength of singly reinforced RCC beams. Assumptions made, permissible shear stress as per I.S., actual average shear stress in singly reinforced concrete beam, concept of diagonal tension, types of shear reinforcement – vertical stirrups and inclined bars, shear strength of a RCC beams section. Bond in RCC beams, concept of bond, local and average permissible bond stresses for plain and deformed bars as per IS minimum length of embedment of bars- Actual anchorage (standard hook, splice length as per IS) loads and loading standard for beams as per IS 875. Design of a singly reinforced concrete beam as per IS from the given data such as span, load and properties of materials used. Design of a lintel design of a main/secondary beam for a RCC flat roof and floor. Design of a cantilever beam.

### Unit – II

**Doubly Reinforced Concrete Beams:** Doubly reinforced concrete beam and its necessity. Strength of doubly reinforced concrete beam section. Design of a doubly reinforced concrete beam.

**RCC Slabs:** Structural behavior of slabs under UDL type of end supports. Design of one way slab. Design of two way slab with the help of table 15 of IS 456.

### Unit – III

**Reinforced Brick work:** Reinforced brick work and its use in slab and lintels. Limitations of the use of RB work. General principle of design of reinforced brick lintels and slabs. Design of RB lintels and slabs. Specifications for RB work construction.

**T- Beams:** Structural behavior of beam and slab laid monolithically. Rules for the design of T-beams. Economical depth of T-beams. Design of simply supported T- beams using IS code.

### Unit – IV

**Columns:** Concept of long short columns. IS specifications for main and lateral reinforcement. Behavior of RCC column under axial loaded short and long columns. (Circular, square and rectangular).

**Stair Cases:** General principles for the functional design of a staircase. Structural behavior of a slab and cantilever type stair (dog-legged). Standards for loadings of a staircase as per IS Design of a slab type Dog logged RCC staircases.

### Unit – V

**Ultimate load theory:** Concept of load theory as applied to RCC. Comparison of working stress theory with the ultimate load theory. Expressions for the ultimate moment of resistance of a rectangular RCC. Beam section (No numerical problem).

**Elements of pre-stressed concrete:** Concept of pre-stressing, situations where pre-stressed concrete is advantageous over RCC. Material used in pre-stressed concrete and specifications as per IS. Post tensioning and pre-tensioning. Freyssinet, Mangel-Blaton and Lea Mc-Call systems. Sketch showing pre-stressing arrangement for RCC beam (no numerical problems). Structural behavior of the following structures (Deflected shape after loading and showing the places for providing reinforcement). Cantilever and counter fort

retaining walls, isolated footing for column. Overhead water tanks (circular and rectangular). RCC pipe. T- beams bridge. RCC siphon and aqueduct.

**Form work and shuttering:** Concept of factors affecting the design of form work and shuttering. Materials used for form work. Sketches of form work for column, beams, slabs and stairs. Precautions to be taken before, during and after RCC construction. Stripping time for form work as per IS (no problems in the design of form work).

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# DESIGN OF STEEL STRUCTURES

## DCE – 304

### Unit – I

Introduction of steel structures, Different types of steels and steel structures. Properties of structural steel as per IS-226. Classification of members and steel sections.

Design of structural steel sections as per I.S. hand book and IS-800. Advantages and disadvantages of steel structures.

Stress-strain diagram and ductility of mild steel. Significance of yield points, breaking and ultimate points. FOS (Factor of safety), loads and stresses, dead load, live load, snow load, wind load, seismic load, erection load, dynamic load and temperature effects, working stress, yield stress and Design concepts; working stress design method, plastic design method.

### Unit – II

#### **Structural Steel Connections:**

Riveted connections: types of rivets, permissible stresses in rivets as per IS: 800 for riveted joints, failure of riveted joints, design of riveted joints for axially loaded members. Testing and inspection of riveted joints as per IS: 800.

#### **Welded Connections:**

Types of welds, permissible stresses in welds, type of welded connections, design of butt and fillet weld connections subjected to axial load only.

#### **Tension Members:**

Permissible stresses in tension for steel. Design of tension members as per IS: 800 (flats, angles and T sections only).

### Unit – III

**Compression Members:** Concept of buckling of columns effective length and slenderness ratio, permissible stress in compression as per IS 800, strength of columns, single and built up sections. IS specifications for design of compression member, design of angles, struts and axially loaded columns (no built up columns) use of tacking rivets, lacing and battening of columns, its use and structural behavior (no design), sketching of a built up column with lacing and battens, column bases design with sketches of slab base and gusseted base and column connections.

### Unit – IV

**Beams:** IS specification for the design of simply supported steel beams including design of base plate at the ends and lintels (laterally restrained beams only)

Structural behavior, deflected shapes and function of various elements of a plate girder and sketching of a plate girder and its elements.

Beam and column connections.

### Unit – V

#### **Steel roof trusses:**

Calculation of dead, live and wind loads, design of purlins, design of members of a roof truss, design of joints, sketching the roof truss on the basis of the above design.

Erection of industrial steel sheds (preparation and inspection of column bases, erection of column longitudinal bracing, field connections erection of trusses).

# CONSTRUCTION MANAGEMENT AND ACCOUNTS

## DCE – 305

### Unit – I

**Site Organization:** Review of plans and specifications. Job layout. Factors influencing job layout. Principle of storing and stacking materials at the site. Location of equipment. Preparation of actual job layout. Organization of layout at site.

**Construction Labor:** Conditions of construction workers in India. Wages paid to workers. Trade unions connected with construction industry and trade union act. Labor welfare payment of wages Act. Minimum wages act. Workmen compensation act, contract labor act. Important provision of the above acts.

Control of progress. Methods of recording progress. Analysis of progress. Taking corrective actions keeping head office informed. Concept of productivity, techniques of increasing productive in construction.

### Unit – II

**Cost Control:** Purpose of cost control, Stages at which cost control is done. Cost control method and records. Collection of site cost data. Daily and weekly cost sheets. Monthly reporting.

**Inspection and Quality Control:** Technical services required for inspection. Major items in construction job requiring quality control.

### Unit – III

**Organization of Public Works Department:** Administration set up of public works department. Administrative and technical functions of Chief Engineer, Superintending Engineer, Ex-Engineer, Sub-divisional Engineer, Junior Engineer/Sectional Officer. Set up of Divisional Office. Accounts branch headed by Divisional Accountant. Drawing branch headed by Head Draftsman or computer. Establishment in the PWD regular establishment (a) Permanent establishment (b) Temporary establishment (c) Work charged establishment (d) Contingent establishment.

**Outline of PWD System of Accounts:** Necessity of a system of accounts. PWD system of accounts. Necessity of maintaining the accounts by heads of account. Head of accounts: (a) Major heads (b) Minor heads (c) Detailed head, detailed head not to be memorized.

**Cash:** Definition of cash. Precautions in custody of cash. Treasury challan. Procedure to fill the prescribed form. Imprest and rules for maintaining imp rest account. Actual filling of the prescribed form definition of temporary advance account. Irregularities in maintenance of imprest account.

**Travelling Allowances (TA):** Meaning of TA. Types of TA. Permanent TA Conveyance allowance. Kilo-metre allowance. Daily allowance.

**Miscellaneous Topics:** Dealing with railways, Booking of consignment. Taking delivery with RR or with out RR. Damaged consignment. Demurrage charges. Wharfage charges. Claims for (a) Goods not received (b) Goods damaged. Credit notes. Instructions on transfer of charges. Maintenance of log books of (a) equipment like road rollers, bull dozers etc. (b) Vehicles like trucks, jeeps etc.

### Unit – IV

**Stores:** What are stores, their necessity and safe custody. Classification of stores, (a) Stores debit-able to suspense heads-stock (b) Stores debit-able to final heads (i) Tools and plant (ii) Road metal (iii) Material charged direct to works.

**Stock:** Kinds of articles in stock-Reserved stock limit of a division, source of stock receipt: (i) Supplier (ii) Other departments, divisions and sub-divisions (iii) manufacture (iv) Works.

Sub heads of stock, quantity accounts of stock (a) Rules for preparing indent and invoice-preparation of indents in proper form (b) Register of stock receipts and issues, procedure for recording entries in proper form. Actual fillings of the form. Monthly, half yearly balance return of stock. Surplus and shortages of stock-action for rectification of accounts. Losses of stock reporting the loss, estimates for loss of stock and writing off. Tools and plant(T and P) meaning, classification of T and P. (register of T and P receipts and issues. Rules for the actual filling of the prescribed form (i) statement of receipt of T and P (ii) statement of issues of T and P in prescribed forms. Source of receipt of T and P. Surplus and shortage of T and P. Reconciliation of accounts. Points of difference in accounts of stock and T and P preparation of survey report in prescribed for, Road metal. Meaning of road metal. Rules for maintaining road metal returns-filling up the prescribed form. Materials charged direct to works: Necessity, circumstances under which materials are directly charged to work (i) in small quantities when a work is done departmentally (maintenance of M.A.S. Accounts is not needed) (ii) in huge amount when the reserve stock limit is over (in such cases M.A.S. account is a must), (iii) when the work is being done through a contractor on labor rates. Materials at site account (M.A.S.), (i) Rules for actual filling of prescribed form i.e. (a) detailed statement of material compare with estimated requirements and (b) report of the value and verification of unused materials. Disposal of surplus materials. (i) return of stock if in good condition and required (ii) transfer to other works (iii) disposal by sale Definition of (i) issue rate (ii) storage rate (iii) storage charges (iv) supervision charges (v) assets and liabilities.

#### **Unit – V**

**Works:** Categories (i) original works (ii) repair works, classification of work according to cost (i) major works (ii) minor works (iii) petty works, condition to be fulfilled before a work can be taken in hand (i) Administrative approval (ii) Technical sanction (iii) appropriation of funds (iv) expenditure sanction (for plan work). Methods of carrying work; departmentally, through daily labor, through contractor (i) piece work system work order (ii) contractor system agreement . Different types of work order (iii) contract system. Different types of contract (i) labor rate (%age above or below) for various items or for covered area construction (private construction only). (ii) through rate basis. Lump sum contract. Lump sum & scheduled rate contract. Allotment of works. Quotation and tenders. Procedure for inviting tenders/quotations. (NIT/NIR). Acceptance of tender contract agreement brief reference. Work order-rules and form, deposit works.

**Payment for works:** Daily labor (meaning (ii) Muster roll (a) rules (b) instruction for maintenance (c) three parts of MR-nominal roll, unpaid wages, detailed of works done and filling of prescribed form. Daily labor report, form M.R. Irregularities of common occurrence. Payment of work charge establishment preparation of pay bill in prescribed form. Payment of contractors and supplier. Record of measurement (a) measurement book (M B) (b) general instructions (c) method of payment after measurements are recorded in MB. Common irregularities in the use and maintenance with regard to its maintenance. Standard measurement book (SMB) (a) purpose and instructions with regard to its maintenance. Bill form for different types of payment. First and final payment intermediate payment (a) meaning (b) prescribed bill form, secured advance (a) meaning (b) prescribed bill form. On account payment, i/c advance payment (a) meaning (b) prescribed bill form. Hand receipt. Cases in which the detailed measurement are dispended with.

# SURVEYING – I

## DCE – 306

### Unit – I

Contouring: Representation of levels on a map/plan. Purpose of contouring, Contour interval and horizontal equivalent. Factors affecting contour interval, Characteristics of contours. Methods of contouring, Direct and indirect, Interpolation of contours. Uses of contour map, Drawing cross section from a contour map. Making alignment of road, railway and a canal on a contour map. Computation of earthwork and reservoir capacity from a contour map.

### Unit – II

Theodolite Surveying: Working of a transit vernier theodolite. Fundamental axes of a theodolite and their relation. Temporary adjustments of a transit theodolite, concept of vernier. Least count and reading a vernier. 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. Concept of coordinates. Balancing a Traverse by Bowditch's rule and Transit rule. Plotting a traverse by Gale's traverse table. Solution of omitted measurements (one side affected). Errors in theodolite survey and precautions taken to minimize them. Limits of precision in theodolite traversing.

### Unit – III

Tacheometric Survey: Tacheometry. Finding stadia constants. Determination of horizontal and vertical distances with horizontal inclined sights (with staff vertical). Use of stadia measurement for traversing and contouring. Use of tacheometric tables.

### Unit – IV

Curves: (a) Simple circular curves. 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 long chord. Deflection angle. Apex distance and Mid-ordinate. Setting out of simple circular curve. (a) By linear measurement only off sets from the tangents. Successive bisection of arc. Offsets from the chord produced (b) By Tangential angles; using a theodolite (B) Transition Curves; Need (Centrifugal force and super elevation) and definition of transition curve. Requirements of transition curves. Setting out of a transition curve by tangential offset only. Length of transition curve. Cubic parabola, calculations of offsets for a transition curve (C) Vertical curves. Setting out of a vertical curve.

### Unit – V

**Triangulation:** Principles, uses, layout/figures of triangulation. Types/system of triangulation, strength of figure. Base line measurement.

**Electronics Distance Measuring Instruments:** Principles and uses. Construction, principle and working of Geodimeter and Tellurometer.

**Setting out Works:** Setting out building, culvert, centerline of a bridge, grade, contour, checking verticality of tall buildings. Setting out the tunnels alignment.

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# TRANSPORTATION ENGINEERING

## DCE-307

### Unit – I

#### Highways:

Introduction: Importance of highway Transportation. History of Highway development in India, scope of future development in India. Functions of I.R.C. classification of roads. Organization of State Highway Department.

Road Geometric: Glossary of terms used in Geometric and their importance, Right of way, formation width, road margin, road shoulders, carriage way, side slopes, kerbs, formation level, camber and gradient. Design and average running speed, stopping and passing sight distances, Horizontal and vertical curves including transition curves and super elevation. Use of IRC design tables and specifications for finding elements of road Geometric. Drawing of typical cross-sections in cutting and filling. Detailed drawing showing the plan. L-section and cross-sections and cross-section of a horizontal and simple circular curve with transition length with the given design data as per IRC.

**Highway Surveys and Plans:** Designation of topographic map Reading the data given of a topographic map. Basic considerations governing alignment. Importance of various stages prepare reconnaissance report. Preliminary survey object, organizing, conducting the information to be collected. Location survey. Standards for preparing the highway plans as per Ministry of Transport.

**Traffic Engineering:** Traffic studies, methods of collection land representation of volume count data. Traffic control devices-signs, marking and signals their effectiveness and location, installation of signs, IRC standards. Types of intersection and choice of each.

**Road Materials:** Different road materials in use viz. soil, aggregates and binders. Function of soil as a highway subgrade. CBR method of finding CBR value and its significance. Aggregates, availability of road aggregate in India, requirements of road aggregates as per ISI specifications. Testing aggregates, Abrasion test, Impact test, Binders, Common binders, cement, bitumen and tar, properties as per ISI specifications, penetration and viscosity test, procedure and significance, cut back and Emulsion and their use.

### Unit – II

**Road Pavements:** Types and their constructions:

Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections. Function of various components, sub grade preparation; setting out alignment of road, setting out bench marks, control pegs for embankment, construction of Embankment, compaction, stabilizing preparation of sub-grade. Methods of checking camber, gradient and alignment as per recommendation of IRC. Equipments used for sub-base preparation. Flexible pavements: Sub-base, necessity and purpose. (1) Stabilized sub-base: purpose of stabilization. (a) Mechanically stabilized (b) Lime stabilized (c) Cement stabilized (d) Fly ash stabilized. Proportioning and methods of construction (2) Granular sub-base (3) Brick sub-base/soiling (4) Stone sub-base/soiling. Methods of construction as per IRC specifications and equipment and used. Surface functions of components namely-leveling course, binder course, surface-course, seal coat. Classification (i) Inverted penetration: type surface dressing, (ii) Plant mix type (a) Premix type (b) Asphaltic concrete. Methods of construction as per IRC specification and quality control equipments used. Rigid pavements, construction of concrete roads as per IRC specification. Form laying, Mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipments used.

**Hill Roads:** Introduction: typical cross-section, showing all details of a hill road in cut, partly in cut and partly in fill. Landslides causes, presentations and control measures.

**Road Drainage:** Necessity of road drainage work, cross drainage works. Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains side ditches for surface drainage. Intercepting drains in hill roads. Details of drains in cutting, embankment. Typical cross-sections.

**Road Maintenance:** Common types of road failures their causes and remedies. Maintenance of bituminous roads such as patch work and resurfacing. Maintenance of concrete roads filling cracks, repairing joint. Maintenance of shoulders (berms). Maintenance of traffic control device. Maintenance of hill roads: (a) Clearing landside debris (b) Maintenance of protective works. Equipment required for maintenance and their use.

**Demonstration Exercise:** Demonstration of the California bearing ratio for the sub-grade soil. Determination of penetration of Bitumen. Determination of impact value of road aggregate.

### Unit – III

**Railways:** An important system of communication in India and its development.

**Permanent way:** Definition of a permanent way, components of a permanent way, sub-grade ballast, sleepers rail fixtures and fastening. Concepts of gauge and different gauges present in India. Suitability of those gauge under different conditions.

**Creep:** its causes and effect. Sleepers: functions of sleepers, different types of sleepers – wooden, steel, cast iron (pot type), concrete and pre-stressed concrete, their sizes, shapes, characteristics and spacing. Ballast: function, materials used for making ballast-stone, brick, slang and cinder, their characteristics. Fixtures and fastenings: (a) Connection of rail to rail Fish plates and fish bolts (b) Rail to sleepers sketches of connection between flat footed rails with various types of sleepers with details of fixtures and fasteners used.

**Geometric:** For broad gauge: Typical cross-sections single and double broad gauge railway tracks in cutting and embankment. Gradients in station yards. Curves: limiting radius of a curve 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 at curves.

### Unit – IV

**Points and Crossing:** Necessity and details of arrangement, sketch of a turnout, definition of stock rail, tongue rail, check rail, load rails, wing rail, point rail, splice rail, stretcher bar, throw of switch, nose of crossing, angle of crossing, overall length of turnout, facing and trailing points.

**Track Laying:** Preparation of sub-grade. Collection of materials-setting up of material depot and carrying out initial operations such as adding of sleepers, bending of rails and assembling of crossings, Definition of bases and rail head. Transportation by material trolleys, rail carriers and materials trains. Method of tracks laying (parallel, telescopic and American methods), Organization of layout of rail head. Ballasting the track.

**Maintenance of Tracks:** (a) Routine maintenance of formation and side slopes, ballast, rails fixtures and drainage. (b) special maintenance Replacement of defective sleepers and rails (c) Tools used for above operations.

**Railways Station:** Layout plan and typical cross-sections of: (a) Single line way side station (b) Double line way side station with details of passenger and goods platform.

### Unit – V

**Introduction:** Bridge its function and component parts. Difference between a bridge and a culvert.

**Classification bridge:** According to life, permanent and temporary, according to road way level deck, through and semi through. According to material-wooden, steel, RCC pre-



stressed and masonry. According to structural form, Beam type RCC Tee beam, balanced cantilever, steel girder bridges, plate girder and box girder. Trussed bridges-N and warren plate girder and box girder. Arch type open spandril and filled spandril barrel and rib type. Suspension type unstiffened sling type, its description with sketches. According to the position of highest flood level, submersible and non-submersible.

**Site selection and collection of data:** Factors affecting the selection of site for a bridge data to be collected.

**Foundations:** Depth of foundation. Type of foundations-spread footing, well foundation and caisson (open type only) pile foundation and caisson (open type only) pile foundation, their details of construction with sketches. Laying of foundation (i) dry soil (ii) soil charged with water (iii) under water.

**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: abutment with wing wall (straight, splayed, return and curved).

**Bridge bearings:** Purpose of bearings, type of bearing fixed plate, sliding plate, deep cast base, rocker and roller, their functions with sketches.

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

**Maintenance of bridges:** Inspection of bridges, Routine maintenance.

**Tunnels:**

Necessity of tunnels. Typical section of tunnels for a National Highway and a single and a double broad gauge railway track. Method of construction of tunnels in soft rock by needle beam method. Method of construction of tunnels in hard rock with full face heading and safety precautions to be taken (a) Ventilation – necessity and method of ventilation; by combination of blowing and exhaust (b) Drainage-methods of draining water and tunnels.

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# ENVIRONMENTAL ENGINEERING

## DCE-308

### Unit – I

#### Water Supply:

Introduction:

Necessity and brief description of water supply system. Water requirements-per capita consumption for domestic use as per ISI standards.

Source of water:

Source of surface and sub surface water and their quality intake works.

Quality of Water:

Standards of portable water as per ISI and International standards.

Water Treatment:

Suspended, colloidal and dissolved impurities, names of physical, chemical and bacteriological tests and their significance.

Sedimentation: Flocculation, disinfection. Flow diagram of different treatment units:

Functions, constructional details working and operation:

- a) Aeration fountain,
- b) Mixer,
- c) Flocculator,
- d) Clarifier,
- e) Slow and rapid sand filter and
- f) Chlorination chamber, Chemicals required in water treatment, their uses and feeding devices. Concept of break point chlorination, super chlorination.

### Unit – II

#### Water Distribution:

Pipes: Cast iron, steel asbestos cement, concrete, plastic, GI and load pipes-their sizes, joints and uses. Appurtenances. Sluice (gate and spindle), air reflux, scour, safety valves, fire hydrants-their working and uses.

Distribution system:

Requirements of distribution-minimum head and rate. Type of layout dead end, grid, radial and ring systems, functions of gravity reservoirs.

Systems of supply intermittent and continuous service reservoirs types, necessity and accessories.

Building Water Supply:

General layout of water supply arrangement for a building (single and multistoried) as per IS code of practice. Water supply fixtures and their installation. Taping of water main.

### Unit – III

#### Sanitary Engineering:

Introduction:

Waste-dry, semi liquid, liquid,

Necessity of systematic collection and disposal of wastes. Brief description of sanitation systems.

#### Sewage:

- i) General composition of sewage, importance of BOD
- ii) Disposal methods-land disposal and by dilution.
- iii) Nuisance due to disposal, self purification of streams, conditions if disposal.

#### Quantity of Sewage:

- i) Sewage-domestic, industrial and storm water.

- ii) Volume of domestic sewage (DWF), variability of flow limiting velocities in sewers.
- iii) Used of table as per IS-1742 and monograms to determine relationship between gradient, diameter, discharge and velocity.

**Sewerage Systems:**

- i) Types of sewerage systems: separate, combined and partial separate.
- ii) Sewers-stoneware, cast iron, concrete, masonry, sewers-their sizes and joints.
- iii) Appertenance (Location, function and construction) manholes, catch basin, inverted siphon, flushing tanks, ventilating shaft.

**Unit – IV**

**Laying of Sewers:**

- i) 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.
- ii) Construction of masonry sewers.
- iii) Construction of surface drains and the different section required.

**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 and per IS code of practice).
- ii) Difference sanitary fittings and their installation.
- iii) Traps, seal in straps, causes of breaking of seal, precautions taken.
- iv) Testing of house drainage.

**Maintenance:**

Inspection of mains.

**Unit – V**

**Sewage Treatment:**

- i) Preliminary, primary, secondary and tertiary treatment, process involved and units employed.
- ii) Sludge treatment-sludge digesion, sludge drying, sludge disposal.
- iii) Plumbing, terminology, types of piping system.

Elements of Rural Sanitation

General Sanitation Problems:

**Air and Noise Pollution:**

- i) Air Pollution: Introduction, classification and properties of air pollutants. Effects of air pollution on human health, vegetation and materials. Air Pollution sampling, measurement and control.
- ii) Noise Pollution: Noise, a type of pollution, its control and remedial steps.

# ENGINEERING DRAWING – II

## DCE-309

### **Unit – I**

Working drawing of residential building showing plan, elevation and sections.

Drawing of civil engineering works such as irrigation channels showing cross sections in cutting and filling, road cross sections. Slab culvert and arch culvert.

### **Unit – II**

Specifications for RCC detailing as per IS 5525 may expanded. (a) details of reinforcement in a simply supported RCC beam singly reinforced and double reinforced, with the given design data regarding the size and number of bars, stirrups their size and spacing (b) details of reinforcement of a RCC square and circular column with isolated square footing (c) details of reinforcement for a cantilever beam with given data regarding the size of the beam and the reinforcement. Bar bending schedules for each of the three above items. Details of reinforcement in plan and section for a simply supported RCC. One way slab with intermediate support and two way slabs from the given data Bar bending schedule.

### **Unit – III**

(a) Details of reinforcement in a two storied RCC internal and corner column. In this, the detail of reinforcement at the junction with beams must be shown from the given design data (b) Details of reinforcement of the junction of a secondary beam with main beam from the given design data. Details of reinforcement for a doglegged stair case in a single storied building providing accesses to the roof with given data. In this, the plan and the sections to be shown. Details of reinforcement for a cantilever retaining wall with the given design data regarding the reinforcement, size and shape of the wall, the cross section of wall and its elevation showing the details of reinforcement. Drawing of overhead tank from the given data.

### **Unit – IV**

Preparation of a working drawing (elevation, plan, details of joints at ridge, eaves and other connections) for a steel roof truss resting on masonry wall with the given span, shape of the truss and the design data regarding the size of the members and the connections.

Steel connections (a) beam to beam connections (seated and framed). (b) beam to column (seated to framed). (c) column base connections (slab base and gusseted) (d) details of column splices (e) connection of steel bracket with the flange of a column.

Details drawing showing plan and elevation for a riveted plate girder in a building with the given design data regarding the size of its parts, with details at the supports and connections of stiffeners flange angles and cover plates with the web.

