1. **Simple Stress and Strain:**

   1.1 Various mechanical properties
      
      1.1.1 Elasticity
      1.1.2 Plasticity
      1.1.3 Ductility
      1.1.4 Brittleness
      1.1.5 Toughness
      1.1.6 Hardness

   1.2 Concept of stress and strain
      
      1.2.1 Type of force - Direct, shear
      1.2.2 Stress - Tensile, compressive, shear

   1.3 Hook's law
      
      1.3.1 Statement of Hook's law
      1.3.2 Young's modulus of elasticity
      1.3.3 Tensile test diagram
         
         1.3.3.1 Gauge length
         1.3.3.2 Limit of proportionality
         1.3.3.3 Elastic limit
         1.3.3.4 Yield point, Yield strength
         1.3.3.5 Ultimate stress
         1.3.3.6 Rupture strength
         1.3.3.7 Nominal stress
         1.3.3.8 Proof stress

   1.4 Working stress and factor of safety
   1.5 Stress and strain calculations
      
      1.5.1 Principle of superposition
      1.5.2 Bar of homogeneous section
         
         1.5.2.1 Bar of uniform cross-section
         1.5.2.2 Bar of steeped cross-section

   1.5.3 Bar of composite section

   1.6 Temperature stresses
      
      1.6.1 Homogeneous section
      1.6.2 Composite section
1.7 Shear stresses
   1.7.1 Modulus of rigidity
   1.7.2 Complementary shear stress
   1.7.3 Concept of single shear and double shear
   1.7.4 Shear strain

1.8 Poisson's ratio and volumetric strain
   1.8.1 Lateral strain
   1.8.2 Longitudinal strain
   1.8.3 Volumetric strain
   1.8.4 Bulk modulus

1.9 Relationship between elastic constants (Derivation)
   1.9.1 \( E=3K(1-2/m) \)
   1.9.2 \( E=2N(1+1/m) \)
   1.9.3 \( E=9KN/(3K+N) \)

2. Compound Stress:
   2.1 Introduction
   2.2 Stress components on an inclined plane
      2.2.1 Induced by direct stresses
      2.2.2 Induced by simple shear
      2.2.3 Induced by direct and simple shear stresses

   2.3 Mohr's circle:
      2.3.1 For like direct stresses
      2.3.2 For unlike direct stresses
      2.3.3 For two perpendiculars direct stresses with state of simple shear

   2.4 Principal stresses and planes
      2.4.1 Major principal stress
      2.4.2 Minor principal stress
      2.4.3 Mohr's circle method for principal stresses

3. Strain Energy:
   3.1 Introduction
   3.2 Strain energy from stress - strain diagram
   3.3 Proof resilience
   3.4 Types of loading - gradual, sudden, impact
      3.4.1 Stress in gradual loading
      3.4.2 Stress in sudden loading
      3.4.3 Stress in impact loading

4. Bending Moments and Shear Force:
   4.1 Basic concept
      4.1.1 Types of support
         4.1.1.1 Movable hinge support (roller)
4.1.1.2 Immovable hinge support
4.1.1.3 Fixed support

4.1.2 Types of beam
4.1.2.1 Cantilever beam
4.1.2.2 Simply supported beam
4.1.2.3 Fixed beam
4.1.2.4 Continuous beam
4.1.2.5 Overhanging beam

4.1.3 Types of load
4.1.3.1 Point load
4.1.3.2 Distributed load - uniformly and non-uniformly

4.2 Shear force and bending moment
4.2.1 Concept and calculation of shear force and bending moment
4.2.2 Sign convention for shear force and bending moment

4.3 Bending moment and shear force diagrams (for point loads, U.D.L. and their combinations)
4.3.1 Cantilever beam
4.3.2 Simply supported beam
4.3.3 Simply supported beam with over hang

5. Moment of Inertia:
5.1 Concept of moment of Inertia
5.2 Radius of gyration
5.2.1 Parallel axis theorem
5.2.2 Perpendicular axis theorem

5.3 Moment of Inertia of various section
5.3.1 Rectangle
5.3.2 Triangle
5.3.3 Circle

5.4 Moment of inertia of unsymmetrical section like: T-section, channel section, L-section etc.

6. Bending Stresses in Beams:
6.1 Concept of bending stress
6.2 Theory of simple bending
6.2.1 Assumptions in theory of simple bending
6.2.2 Use of equation $MfE = Iy/R$ (with proof)

6.3 Design criterion and section modulus
6.3.1 Section modulus
6.3.2 Calculation of max bending stress in beams of rectangular, circular, I and T section
7. Shear Stress in Beams:
   7.1 Concept
   7.2 Use of equation \( q = \frac{F}{Ib} (Ay) \) (with proof)
   7.3 Shear stress distribution diagram of various sections
      7.3.1 Rectangle
      7.3.2 I section
      7.3.3 T section
      7.3.4 Channel section
      7.3.5 H section
      7.3.6 + section
      7.3.7 Circular section

8. Deflection:
   8.1 Concept of deflection of a beam
   8.2 Use of standard formula for calculating deflection (for point loads, U.D.L. and their combination)
      8.2.1 Cantilever beam
      8.2.2 Simply supported beam

9. Columns and Struts:
   9.1 Concept of column and struts
   9.2 Modes of failure
   9.3 Types of column; long and short
   9.4 Buckling loads
   9.5 Slenderness ratio
   9.6 Euler’s formula (without proof)
      9.6.1 Both ends hinged
      9.6.2 One end fixed and other end free
      9.6.3 Both ends fixed
      9.6.4 One end fixed and other end hinged
      9.6.5 Limitations of Euler’s Formula
      9.6.6 Equivalent length
   9.7 Rankine’s formula

10. Torsion of Shaft:
   10.1 Concept of torsion
      10.1.1 Angle of twist
      10.1.2 Polar moment of Inertia
      10.1.3 Assumptions in the theory of pure torsion
   10.2 Derivation and use of
      \( q \frac{4}{J} \)
   10.3 Relation between power and torque
   10.4 Combined stress due to bending and torsion in solid and hollow shaft
11. Springs:

11.1 Introduction and classification of springs
11.2 Flat carriage springs

11.2.1 Application of flat carriage springs
11.2.2 Determination of number of leaves and their sections, deflection and radius of curvature
11.2.3 Quarter elliptical spring

11.3 Closely coiled helical springs:

11.3.1 Application of closely coiled helical springs
11.3.2 Determination of deflection, angle of twist, number of coils and stiffness under axial loading in closely coiled helical springs.

12. Thin Cylindrical Shells:

12.1 Use of cylinders
12.2 Stresses due to internal pressure

12.2.1 Circumferential stress or hoop stress
12.2.2 Longitudinal stress

12.3 Design of thin cylinders - calculation of the various dimensions of a thin cylinder

13. Combined Direct and Bending Stress:

13.1 Effect of eccentricity
13.2 Stress due to eccentric load
13.3 Middle third rule
13.4 Quarter rule

PRACTICALS

1. Study of extensometers
2. Study and operation of UTM
3. Tensile test on mild steel specimen and plotting stress strain curve.
5. Compression test on common structural materials viz. timber, cast iron etc.
6. Determination of toughness of cast iron and mild steel specimen by Charpy and Izod test.
8. Determination of deflection for various types of loading
9. Torsion test on brass and mild steel
10. Determination of stiffness of close coiled spring

REFERENCE BOOKS:

2. Strength of Materials Ramamurtham
5. Strength of Materials (Hindi) Gurcharan Singh

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CODE DCC 302

PAPER – II FLUID MECHANICS

1. Introduction:
   
   1.1 Introduction concepts
      
      1.1.1 Fluids and solids
      1.1.2 Liquid, gas and vapour
   
   1.2 Fluid mechanics
      
      1.2.1 Kinematics
      1.2.2 Dynamics
   
   1.3 Fluid properties
      
      1.3.1 Density
      1.3.2 Specific volume
      1.3.3 Specific gravity
      1.3.4 Viscosity
         
         1.3.4.1 Newton's law of viscosity
         1.3.4.2 Dynamic and Kinematic viscosity
      
      1.3.5 Compressibility
      1.3.6 Surface tension - soap bubble, drop
      1.3.7 Capillarity
      1.3.8 Vapour pressure and its importance

2. Fluid Pressure and its Measurement:
   
   2.1 Definition and its units
   2.2 Pascal's law
      
      2.2.1 Intensity of pressure at a point in fluid at rest
      2.2.2 Pressure head
   
   2.3 Pressure
      
      2.3.1 Atmospheric pressure
      2.3.2 Gauge pressure
      2.3.3 Vacuum pressure
      2.3.4 Absolute pressure
      2.3.5 Differentials pressure
      Law of hydrostatic pressure
   
   2.4 Brahma's press
   2.5 Pressure measurement
   2.6 Manometers
      
      2.6.1.1 Piezometer - its limitation
2.6.1.2 U-tube - simple, differential, inverted
2.6.1.3 Micro-manometers
2.6.1.4 Inclined tube micro-manometers

2.6.2 Mechanical gauge

2.6.2.1 Bourdon gauge
2.6.2.2 Bellow gauge
2.6.2.3 Diaphragm gauge
2.6.2.4 Dead weight gauge

3. Hydrostatics:

3.1 Total pressure
3.2 Centre of pressure
3.3 Total pressure and center of pressure in following cases

3.3.1 Plane surface immersed horizontally
3.3.2 Plane surface immersed vertically
3.3.3 Plane surface immersed at an angle
3.3.4 Curved surface (no proof)

3.4 Working of lock gates, sluice gate
3.5 Pressure on masonry dams of rectangular and trapezoidal sections and their condition of stability

4. Hydrokinematics:

4.1 Description of fluid flow

4.1.1 Eular approach
4.1.2 Lagrangian approach

4.2 Definition of path line, stream line
4.3 Types of flow

4.3.1 Steady - Non steady
4.3.2 Uniform - Non uniform
4.3.3 Laminar - Turbulent
4.3.4 One, Two, Three dimensional flow
Continuity equation (no proof):

4.4

4.4.1 Assumption
4.4.2 Rate of discharge
4.4.3 one dimensional flow

5. Hydrodynamics and Measurement of Flow:

5.1 Energy of fluid - pressure, kinetic and potential
5.2 Bernoulli's theorem (no proof)

5.2.1 Assumptions and its limitation
5.2.2 Conversion of pressure into pressure head, velocity into kinetic head

5.3 Applications of Bernoulli's theorem

5.3.1 Pitot-tube
5.3.2 Venturimeter
5.3.3 Orificemeter
6. **Orifices and otches:**

6.1 Definition and classification
6.2 Discharge through small orifices

6.2.1 Coefficient of contraction
6.2.2 Coefficient of velocity
6.2.3 Coefficient of discharge
6.2.4 Coefficient of resistance

6.3 Time of emptying a vessel of uniform cross section through an orifice at bottom.
6.4 Notches - Classification

6.4.1 Crest, Nappe
6.4.2 Difference between notch and weir

6.5 Flow over -

6.5.1 Triangular notch
6.5.2 Rectangular notch

[Simple numerical problems without velocity of approach]

7. **Flow Through Pipes:**

7.1 Laws of fluid friction.
7.2 Losses of head in pipes
7.3 Hydraulic gradient line.
7.4 Total energy line.
7.5 Flow through pipes in series.
7.6 Equivalent length
7.7 Flow through parallel pipes (No branched pipes)
7.8 Flow through siphon
7.9 Definition of water hammer and its effect (No mathematical calculations)

8. **Flow through Channels:**

8.1 Types of flow

8.1.1 Uniform and Non uniform flow, difference in pipe and channel flow.
8.2 Classification of an open channel
8.3 Formula for uniform flow in open channels

8.3.1 Chezy's formula
8.3.2 Kutter's formula
8.3.3 Bazin's formula
8.3.4 Manning's formula

8.4 Factors affecting roughness co-efficient
8.5 Values of roughness co-efficient for different channel conditions
8.6 Most economical section of channel -

8.6.1 Rectangular section
8.6.2 Triangular section
8.6.3 Trapezoidal section
8.6.4 Circular section

8.7 Specific energy of flow in a channel at a cross section
8.8 Explanation of the terms -

8.8.1 Critical depth
8.8.2 Critical flow
8.8.3 Sub-critical flow
8.8.4 Super-critical flow
8.8.5 Hydraulic jump

8.9 Measurement of flow in open channel by -

8.9.1 Surface slope measurement
8.9.2 Velocity measurement
8.9.3 Flow measurement

9. Turbines:

9.1 Introduction
9.2 Classification of turbines
9.3 Working principles of impulse and reaction turbine
9.4 Constructional detail and working of different types of turbines (No mathematical analysis.)

9.4.1 Pelton wheel turbine
9.4.2 Francis turbine
9.4.3 Kaplan turbine

10. Pumps:

10.1 Classification of pumps
10.2 Constructional detail of reciprocating pump
10.3 Constructional detail of centrifugal pump
10.4 Comparison of reciprocating and centrifugal pump
10.5 Brief description of submersible pump and deep well turbine pump
10.6 Installation and maintenance of pumps

PRACTICALS

1. Determination of coefficient of friction in pipe
2. Determination of losses of head in flow through pipes
3. Determination of roughness coefficient for different types of channel surfaces.
4. Determination of surface velocity and mean velocity in an open channel
5. Study of constructional features of working of Pelton wheel turbine and Francis turbine.
6. Study of constructional features and working of centrifugal and reciprocating pump
7. Study of different types of manometers and pressure gauges
8. Verification of Bernoulli's theorem
9. Determination of \( C_d \) for Venturimeter
10. Determination of \( C_d \) for Orificemeter
11. Determination of \( C_c, C_v \) and \( C_d \) of small orifice
12. Visit of a nearby dam

REFERENCE BOOKS:

1. Hydraulics
2. Hydraulics
3. Hydraulics
4. Hydraulics
5. Fluid Mechanics & Machines
6. Fluid Mechanics & Machines
7. Fluid Mechanics & Machines
8. Hydraulics & Pneumatics

Modi & Seth
K. R. Arora
Anand & Kulsrestha
B. L. Gupta
Dr. Jagdish Lal
Dr. R.K.Bansal
H.L. Stewart.

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PAPER – III BUILDING TECHNOLOGY

1. Introduction :
   1.1 Definition of a building
   1.2 Classification of building based on occupancy
   1.3 Explanation of different parts of a building

2. Foundation :
   2.1 Concept of foundation
   2.2 Factors affecting selection of foundations
   2.3 Definition and importance of bearing capacity, Average bearing capacity of common soils.
   2.4 Types of foundations- shallow and deep foundations
   2.5 Shallow foundation- spread footings, raft and inverted arch foundation. Rankine's formula for depth of foundations
   2.6 Deep Foundation - Pile foundation, their suitability, Classification of piles according to function, material and installation
   2.7 Causes of failure of foundation and remedial measures.

3. Walls :
   3.1 Purpose of walls
   3.2 Types of walls- Load bearing, non-load bearing
   3.3 Partition walls - construction details, suitability and use of brick and wooden partition walls.
   3.4 Cavity walls - Brief description and constructional detail of cavity walls

4. Brick Masonry :
   4.1 Definition related to brick masonry
   4.2 Bond, necessity of bond
   4.3 Types of bonds- English, Flemish, header and stretcher, T-junction, corner junction.
   4.4 Sketches for 1, 1½ and 2-brick thick wall and square pillars
   4.5 Construction of brick walls-method of laying brick in walls and precautions to be taken for it.

5. Stone Masonry :
   5.1 Definition related to stone masonry
   5.2 Dressing of stones - Hammer dressing, chisel dressing
   5.3 General principles for construction of stone masonry
   5.4 Brief description and sketches of different types of stone masonry- Ashlar, random rubble and coursed rubble. Ashlar facing to coursed, rubble and brick masonry.
   5.5 Brief description, sketches and uses of joggles, dowells and cramps in stone masonry.

6. Scaffolding, Shoring and Underpinning :
   6.1 Brief description and application of different types of scaffolding and shores.
   6.2 Meaning and need for underpinning.
7. **Dampness and its Prevention:**

7.1 Causes of dampness in buildings and principles of its prevention.
7.2 Materials commonly used for damp proofing.
7.3 Damp proof course
7.4 Anti termite treatment of buildings before and after construction

8. **Arches and Lintels:**

8.1 Meaning and uses of arches and lintels
8.2 Glossary of terms related to arch and lintels
8.3 Thickness of lintels. Effective span
8.4 Type of arches e.g. semi circular, segmental arches, elliptical, pointed, relieving arch, flat arch.
8.5 Thickness of semi-circular and segmental arches by empirical rules

9. **Doors:**

9.1 Types of door frames - stone, timber, steel, concrete
9.2 Description and sketches of different types of doors ledged, batten ed and braced door, framed and panelled door, glazed and panelled doors, louvered doors, flush doors.
9.3 Use of collapsible door, rolling steel doors, side sliding doors, wire mesh doors.

10. **Windows:**

10.1 Names, uses and sketches of - fully panelled window, fully glazed windows
10.2 Casement and pivoted window, dormer window, clearstory window, skylight, fanlight and ventilators
10.3 Window frames of different materials - wood, steel, aluminium.

11. **Stairs and Stair Cases:**

11.1 Glossary of terms related to stairs
11.2 Brief description and sketches of common types of staircase : Straight flight, Quarter turn, Half turn dog legged and open newel, Bifurcated, Circular, Spiral
11.3 Classification of staircases according to materials used.
11.4 Rise, Tread & Going of the different type of stair.

12. **Roofs:**

12.1 Functions of roofs and ceilings. Brief description, constructional details and suitability of common types of roofs.
12.2 Definition of terms for pitched roofs, principal rafter, common rafter, jack rafter, hip rafter, valley rafter, ridge piece, caves, purlins, cleats, wall plates, valley gutter, side gutter, gable, facia board.
12.3 Roof coverings for pitched roofs - Asbestos cement and C.G.I. method of arranging and fixing to battens, rafters, purlins both steel and wooden.
12.4 Drainage arrangement for pitched and flat roofs.

13. **Floors:**

13.1 Ground floors
13.2 Brief description, uses and construction of ground floors - Brick on edge; tiles, stone slab, marble and glazed tiles, lime concrete, cement concrete, terrazzo and mosaic.

14. **Finishing of buildings:**

14.1 Different types of plastering, rendering and painting
14.2 Methods of plastering, and curing
14.3 Defects in plasters and repairs of the defects.
14.4 Different types of painting uses and methods of painting.
14.5 White washing, colour washing and distempering- water and oil bound distempers. Application of cement plastic paints
14.6 Provision of expansion joints in building floors, walls and roofs.

15. Building Bye Laws:

15.1 Study of building bye laws as per IS 1256-1967
15.2 Terminology related to residential building, building permit occupancy certificate, unsafe buildings, enforcement code, offences and penalties.
15.3 Health sanitation and other requirements, means of access, open space requirements, plinth area, projections, covered area in residential plots.
15.4 Distance from electric lines, plinth regulation, height regulation, size of rooms, lighting and ventilation, construction of water closets, kitchen, mezzanine floor, stair cases, drainage and sanitation.

16. Basic Principles of Building Planning:

16.1 Aspect, prospect its internal circulation, privacy grouping(i) living areas (ii) sleeping areas and (iii) working areas
16.2 Roominess, flexibility, furniture setting, sanitation elegance and economy
16.3 Arrangement of doors, windows, cupboards etc for a residential building

17. Orientation:

17.1 Orientation of buildings as per I.S. 7662 in relation to sun and wind directions, rain, internal circulation and placement of room, commensurate with available areas and requirements.
17.2 Preparation and study of sun chart on polar graphs. Sun shading devices-types sketches suitability, for different orientations.

18. Site Selection:

18.1 Selection of site for a building and building complex
18.2 Comparative study of sites with respect to local topography, flooding, soil access, location
18.3 Communication links, with surroundings availability of water and electricity, prevailing wind, made up ground, water table, trees etc.

19. Design of Buildings:

19.1 Common standards for floor space and cubical contents for residential building and public building (Schools, Hostels, Dispensaries, Panchayatghars).
19.2 Economical design of single room tenements, double room tenement and residential flats
19.3 Design of a residential building and public buildings (School, Hostel, Dispensary, Panchayatghar) including location of water supply line, drainage line and placing of electrical fittings.
19.4 Details of a toilet, kitchen and staircase for modern residential buildings.

REFERENCES:

2. Building Construction Sushil Kumar.

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CODE DCC304  

PAPER – IV SURVEYING - I

1. Introduction :
   1.1 Plane surveying and geodetic surveying
   1.2 Uses of surveying in engineering.
   1.3 Principles of surveying

2. Chain Surveying :
   2.1 Different types of chains
      2.1.1 Metric chain
      2.1.2 Engineer’s chain
      2.1.3 Gunter’s chain
      2.1.4 Revenue chain
   2.2 Types of Tapes
      2.2.1 Linen tapes
      2.2.2 Metallic tapes
      2.2.3 Invar tapes
      2.2.4 Steel band
   2.3 Ranging rods
   2.4 Offset rods
   2.5 Line ranger
   2.6 Cross staff
   2.7 Optical square
   2.8 Arrows
   2.9 Folding, unfolding, of chains
   2.10 Testing and adjusting of chains
   2.11 Ranging
      2.11.1 Direct ranging
      2.11.2 Indirect ranging
   2.12 Chaining on plane ground,
   2.13 Conventional signs in surveying
   2.14 Recording in field book
   2.15 Chaining on sloping ground
      2.15.1 Direct method
      2.15.2 Indirect method
2.16 Common errors and precautions
2.17 Traversing
2.18 Fixing and marking stations
2.19 Base line, Check lines and Tie lines
2.20 Common obstacles in chaining
2.21 Plotting of traverse

3. Compass Surveying:

3.1 Prismatic compass
3.2 Surveyor’s compass
3.3 Difference in the above two compasses
3.4 Definitions

3.4.1 Meridian - magnetic, true, arbitrary
3.4.2 Magnetic dip
3.4.3 Magnetic declination
3.4.4 Fore bearing
3.4.5 Back bearing

3.5 Whole circle bearing system
3.6 Quadrilateral bearing system
3.7 Conversion from whole circle bearing to quadrilateral bearing and vice versa.
3.8 Reading the bearing of lines
3.9 Computation of internal angles
3.10 Distribution of instrumental error
3.11 Local attraction
3.12 Correction of bearings due to local attractions
3.13 Traversing with chain and compass

3.13.1 Open traverse
3.13.2 Closed traverse

3.14 Booking in field book
3.15 Adjustment of error in a closed traverse

4. Levelling:

4.1 Definitions

4.1 Level surface
4.2 Level line
4.3 Horizontal line
4.4 Vertical line
4.5 Mean sea level
4.6 Reduced level

4.2 Names and function of different parts of -

4.2.1 Dumpy level
4.2.2 Tilting level
4.2.3 Auto level

4.3 Difference in dumpy and tilting level.
4.4 Internal and external focusing telescope
4.5 Temporary adjustments of dumpy and tilting level
4.6 Levelling staff
4.6.1 Self reading
4.6.2 Telescope staff
4.6.3 Target staff
4.7 Reading a levelling staff
4.8 Levelling with dumpy and tilting levels

4.8.1 Taking observations
4.8.2 Recording in a level book.

4.9 Calculation of R.L.

4.9.1 Height of instrument method
4.9.2 Rise and fall method
4.9.3 Arithmetical checks

4.10 Types of levelling

4.10.1 Fly levelling
4.10.2 Differential levelling
4.10.3 Profile levelling
4.10.4 Reciprocal levelling
4.10.5 Precise levelling

4.11 Effect of curvature and refraction in levelling and their corrections.
4.12 Permanent adjustment

4.12.1 Dumpy level
4.12.2 Tilting level
4.12.3 Automatic level

5. Contouring :

5.1 Concept
5.2 Purpose of contouring
5.3 Contour interval
5.4 Horizontal equivalent
5.5 Factors affecting contour interval
5.6 Characteristics of contours
5.7 Methods of contouring - direct and indirect
5.8 Interpolation of contours
5.9 Uses of contour maps
5.10 Drawing cross sections from contour maps.

6. Plane Table Surveying :

6.1 Description and uses of plane table and its accessories
6.2 Advantages of plane table surveying
6.3 Centering, levelling and orientation of plane table
6.4 Radiation
6.5 Intersections
6.6 Traversing
6.7 Resection
6.8 Two point problems
6.9 Three point problems
6.10 Errors in plane tabling

7. Minor Instrument :

7.1 Study and uses of

7.1.1 Hand level
7.1.2 Abney level
PRACTICALS

1. Study of
   1.1 Different types of chains and tapes
   1.2 Cross staff
   1.3 Optical square
   1.4 Line ranger

2. Use of Chains :
   2.1 Folding and unfolding
   2.2 Ranging and chaining on plane and sloping surface
   2.3 Setting right angles.
   2.4 Setting parallel lines.
   2.5 Taking offsets.

3. Chain surveying of small areas
4. Study of prismatic compass
5. Study of surveyor compass
6. Measurements of bearing of lines
7. Transverse by compass and adjustment of error
8. Study of the component parts and handling of
   8.1 Dumpy level
   8.2 Tilting level
   8.3 Staves

9. Temporary adjustments of a dumpy level and a tilting level
10. Use of dumpy level and tilting level in differential levelling and levelling for cross section and longitudinal section.
    Recording in level book and plotting.
11. Study of Automatic level
12. Study and use of plane table and its accessories e.g. stand, table, clamping arrangement, sight vane, through
    compass, plumbing fork, plumb bob, sprit level etc.
    Methods of plane tabling
13. 13.1 Radiation
    13.2 Intersection
    13.3 Traversing
    13.4 Resection

14. Two and three point problems
15. Preparation of a plan on area by plane table survey.
16. Plotting spot levels of a given area by the grid method and interpolation of contours.
17. Preparations of a contoured plan of an uneven area with the help a level and a plane table.
18. Study of
   18.1 Hand and abney level
   18.2 Clinometer
   18.3 Planimeter
   18.4 Pantagraph
   18.5 Sextant
   18.6 Cylon ghat tracer
PAPER – V TRANSPORTATION ENGINEERING

CODE DCC305
CC 305

1. Introduction :
   1.1 Importance of highway transportation
   1.2 Different modes of transportation
   1.3 Scope of highway engineering

2. Highway Development and Planning :
   2.1 Historical development of road construction
   2.2 Necessity of highway planning
   2.3 Classification of roads
   2.4 Road pattern
   2.5 Highway planning in India

3. Highway Geometric Design :
   3.1 Highway alignment and basic consideration governing alignment for a road
   3.2 Glossaries of terms used in road geometric and their importance
   3.3 Highway cross section elements
   3.4 Sight distances
   3.5 Design of horizontal alignments
   3.6 Design of vertical alignments

4. Traffic Engineering :
   4.1 Scope of traffic engineering
   4.2 Passenger car unit (PCU)
   4.3 Traffic control devices - signs, signals, marking, traffic islands
   4.4 Causes and precaution of road accidents
4.5 On street and off street parking
4.6 Highway lighting

5. Highway Materials:

5.1 Subgrade soil

5.1.1 Desirable properties
5.1.2 Highway research board classification of soils
5.1.3 CBR test

5.2 Stone aggregates

5.2.1 Desirable properties
5.2.2 Attrition and abrasion tests
5.2.3 Crushing test
5.2.4 Impact test
5.2.5 Shape test

5.3 Bituminous materials

5.3.1 Penetration test
5.3.2 Softening point test
5.3.3 Ductility, flash and fire point
5.3.4 Specific gravity test

6. Construction of Roads:

6.1 Introduction
6.2 Water Bound Macadam roads
6.3 Bituminous roads
6.4 Cement concrete road

7. Highway Maintenance:

7.1 Common types of road failures
7.2 Routine maintenance

8. Road Drainage and Road Arboriculture:

8.1 Necessity of road drainage
8.2 Surface and sub surface drainage
8.3 Object of road arboriculture
8.4 Common roadside trees
8.5 Plantation and protection of trees

9. Bridges:

9.1 Introduction: Classification of bridges
9.1.1 Temporary bridges
9.1.2 Permanent bridges

9.2 Selection of site of the bridges
9.3 Economical span of the bridges, calculation of discharge, velocity, afflux by various methods
9.4 Cause ways, culverts - brief description with sketches
9.5 Brief introduction to piers, abutments, wing walls and bearing.
10. Railways:

10.1 Railways, its importance
10.2 Railway systems in India
10.3 Gauge, different gauges in India
10.4 Advantages and disadvantages of more than one gauge
10.5 Definition of a permanent way

11. Rails:

11.1 Function of rails
11.2 Requirement of rails
11.3 Types of rail sections - Double headed rails, bull headed, flat footed rail
11.4 Standard length and weight of flat-footed rails for different gauges
11.5 Wear of rails - its causes and effects
11.6 Failures of rails
11.7 Creep - its definition, causes, effect and prevention
11.8 Corrugated or roaring rails.
11.9 Conning of wheels

12. Sleepers:

12.1 Functions of sleepers
12.2 Characteristics of good sleeper
12.3 Different types of rail sleepers - wooden, steel, cast iron, concrete and prestressed concrete
12.4 Size and shapes of all type of sleepers
12.5 Sleeper density

13. Ballast:

13.1 Functions of ballast
13.2 Characteristics of good ballast
13.3 Materials used as ballast - broken stone, gravel, cinder, kanker, moorum, brickbats etc.
13.4 Size and section of ballast
13.5 Quantity of ballast
13.6 Renewal of ballast

14. Fixture and Fastenings:

14.1 Connection of rail to fish plate and welded rails
14.2 Connection of rail to sleepers
14.3 Details of fixtures used

15. Railway Geometries:

15.1 Alignment of railway line
15.2 Typical cross sectioning singles and doubles tracks in cutting and embankment
15.3 Gradients, curve, transition length as per railway code
15.4 Superelavation, cant deficiency
15.5 Widening of gauge on curves

16. Points and Crossing:

16.1 Necessity and details of arrangement
16.2 Sketch of a turnout
16.3 Functions of different parts and components
16.4 Different types of point and crossing
16.5 Turnout, crossover, scissors, diamond crossing with slips, double junctions, gathering lines
16.6 Turn tables and triangles.
17. **Tracks Laying** :

17.1 Plate laying  
17.2 Methods of plate laying  
17.3 Duties of a permanent way inspector

18. **Maintenance** :

18.1 Routine maintenance of formation and side slope  
18.2 Routine maintenance of ballast, fixtures and drainage  
18.3 Special maintenance - replacement of defective sleeper and rails  
18.4 Tools used for the maintenance of track.

19. **Stations and Yards** :

19.1 Classification  
19.2 Requirement and layout of station and yards  
19.3 Flag station, wayside station, junction, terminal station  
19.4 Passenger yards, goods yards  
19.5 Marshalling yards, locomotive yards  
19.6 Station equipments

20. **Signallings** :

20.1 Classification and functions of signal  
20.2 Types of signal - Semaphore, Warner, shunt disc, Colour light signal, outer, home, routing signal, starter, advanced starter, calling on and co-acting signals  
20.3 3-aspect signals  
20.4 Absolute block system  
20.5 Automatic block system  
20.6 Pilot guard system

21. **Tunnelling** :

21.1 Introduction  
21.2 Advantages and disadvantages  
21.3 Methods of construction of tunnels full-face method and needle beam method  
21.4 Factors effecting the alignment of tunnels  
21.5 Description and sketches of different types of tunnels  
21.6 Necessity of ventilation  
21.7 Method of ventilation  
21.8 Drainage of tunnels  
21.9 Safety precautions to be taken at the time of construction of tunnels.

**PRACTICALS**

1. Determination of abrasion value of aggregates by Los Angel's test  
2. Determination of impact value of aggregate  
3. Determination of crushing value of given aggregates  
4. Determination of C.B.R. value of sub grade soil  
5. Determination of penetration value of bitumen  
6. Determination of softening point of bitumen  
7. Determination of ductility of bitumen  
8. Determination of flash and fire point of bitumen
REFERENCE BOOKS:

2. Highway Engg. Priyani
4. Railway Bridges and Tunnels Vazirani and Chandola
5. Railway Bridges and Tunnels B.L. Gupta
6. Railway Bridges and Tunnels G.C. Singh
7. Railway Engineering Saxena and Arora
8. Railway and Tunnels S.C. Rangwala

FORTH SEMESTER

PAPER – V SOIL AND FOUNDATION ENGINEERING

CODE DCC405
CC 405

1. Introduction:

1.1 Introduction and scope of soil engineering
1.2 Origin and formation of soils
1.3 Major soil deposits of India

2. Fundamental Definitions and Relationships:

2.1 Representation of soil as a three phase system
2.2 Definition of moisture content, unit weights, density, and specific gravity, void ratio, porosity, degree of saturation and the relationship among them.

3. Classification of Soils:

3.1 Classification of soils as per particle size and plasticity chart according to IS specifications
3.2 Particle size distribution - Sieve analysis
3.3 Consistency of soils – Liquid limit, Plastic limit and Shrinkage limit
3.4 Field identification of soil

4. Permeability of Soils:

4.1 Definition of permeability and related terms
4.2 Darcy's law of flow through soils
4.3 Factors affecting permeability
4.4 Measurement of permeability in laboratory
4.5 Measurement of permeability in field

5. Compaction:

5.1 Process of compaction
5.2 Proctor's compaction test
5.3 Moisture content and density relationships
5.4 Factors affecting compaction
5.5 Different methods of compaction
5.6 Brief description of field compaction methods, equipments and suitability for different type of soils.

6. Consolidation :

6.1 Meaning and explanation of phenomena
6.2 Total stress, neutral stress and effective stress
6.3 Measurement of compressibility characteristics
6.4 Consolidation test
6.5 Pressure void ratio relationship in consolidation
6.6 Practical methods of accelerating consolidation
6.7 Normally consolidated and over consolidated soil

7. Shear strength :

7.1 Concept of shear strength
7.2 Factors contributing to shear strength of soils.
7.3 Drainage conditions of testing.
7.4 Determination of shearing strength by direct shear test, unconfined compression test, vane shear test.

8. Bearing Capacity :

8.1 Concept of bearing capacity
8.2 Terzaghi's bearing capacity factors and bearing capacity as per IS code
8.3 Factors affecting bearing capacity.
8.4 Determining bearing capacity of soil by plate load test and Standard Penetration Test.
8.5 Methods of improving bearing capacity

9. Earth Pressures :

9.1 Active and passive earth pressure
9.2 Earth pressure at rest
9.3 Determination of earth pressure by Rankine's theory for cohesionless soil (No derivation)

10. Soil Exploration :

10.1 Functions and scope of soil exploration
10.2 Excavation and boring methods of sub-surface exploration
10.3 Types of samplers
10.4 Disturbed and undisturbed samples
10.5 Labelling, sealing and preservation of samples

11. Foundation :

11.1 Introduction to different types of foundation
11.1.1 Shallow foundation
11.1.2 Deep foundation
11.1.3 Raft foundation
11.1.4 Well foundation

12. Pile Foundation :
12.1 Definition of pile foundation
12.2 Places of application
12.3 Classification of piles based on functions and materials.
12.4 Formula related to pile foundations –
12.4.1 Static formula
12.4.2 Dynamic engineering news formula
12.4.3 Hiley's formula
13. Soil Stabilisation:

13.1 General principles of soil stabilisation

13.2 Different types of soil stabilisation –

13.2.1 Mechanical Stabilisation
13.2.2 Water reluctant chemicals
13.2.3 Cement stabilisation
13.2.4 Lime stabilisation
13.2.5 Bitumen stabilisation
13.2.6 Stabilisation by grouting

PRACTICALS

1. Determination of moisture content
2. Determination of specific gravity of soils
3. Grain size analysis (by sieve analysis)
4. Determination of liquid and plastic limits of soils
5. Determination of field density by core cutter method
6. Determination of field density by sand replacement method
7. Proctor's compaction test
8. Constant head and falling head permeability test.
9. Determination of shear strength from direct shear test
11. Conduct of SPT
12. Soil sampling by auger and tube sampler.

REFERENCE BOOKS:

1. Soil Engg B.C. Punmia
2. Basic Soil Engg. Dr. Alam Singh
4. Soil and Foundation Engineering (Hindi) B.C. Punmia
5. Soil and Foundation Engineering (Hindi) B.L. Gupta
6. Soil Mechanics(Hindi) Janardan Jha

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PAPER – IV CONCRETE TECHNOLOGY

CODE DCC404 CC 404

RATIO ALE

COTE TS

1. Cement:

1.1 Manufacture of Portland cement
1.2 Chemical composition
1.3 Hydration of cement
1.4 Types of cement

1.4.1 Ordinary Portland cement
1.4.2 Rapid hardening cement
1.4.3 Extra rapid hardening cement
1.4.4 Sulphate resisting cement
1.4.5 Blast furnace cement
1.4.6 Quick setting cement
1.4.7 Super sulphate cement
1.4.8 Low heat cement
1.4.9 Portland pozzolana cement
1.4.10 White cement
1.4.11 Hydrophobic cement
1.4.12 Oil-well cement
1.4.13 High alumina cement

1.5 Testing of cement

1.5.1 Field testing
1.5.2 Fineness test
1.5.3 Specific gravity of cement
1.5.4 Standard consistency test
1.5.5 Setting time test
1.5.6 Strength test
1.5.7 Soundness test

2. Aggregates:

2.1 Classification of aggregates according to sources
2.2 Shape, size and texture
2.3 Bulk density
2.4 Specific gravity
2.5 Water absorption and moisture content
2.6 Bulking of aggregate
2.7 Alkali-aggregate reaction
2.8 Grading of aggregates
2.9 Sieve analysis
2.10 Standard grading curve
2.11 Specified grading
2.12 Gap grading
2.13 Flakiness index
2.14 Elongation index
2.15 Fineness modulus
2.16 Crushing value
2.17 Ten percent Fines value

3. Water:

3.1 Indian Standards for quality of water for use in cement concrete.
3.2 Effect of impurities in water on concrete.

4. Admixtures and Construction Chemical:

4.1 General
4.2 Admixtures
4.2.1 Plasticizers
4.2.2 Super plasticizers
4.2.3 Retarders
4.2.4 Accelerators
4.2.5 Air entraining admixtures
4.2.6 Pozzolanic or mineral admixtures
4.2.7 Air detaining admixtures
4.2.8 Alkali aggregate expansion inhibitors
4.2.9 Workability admixtures
4.2.10 Grouting admixtures
4.2.11 Bonding admixtures

4.3 Construction chemicals
4.3.1 Concrete curing compounds
4.3.2 Polymer bonding agents
4.3.3 Floor hardener and dust proofers
4.3.4 Surface retarders
4.3.5 Bond aid for plastering
4.3.6 Ready to use plaster
4.3.7 Guiniting agents
4.3.8 Water proofing

5. Fresh Concrete :

5.1 Workability
5.2 Factors affecting workability
5.3 Measurement of workability

5.3.1 Slump test
5.3.2 Compacting factor test
5.3.3 Vee-Bee consistometer test

5.4 Segregation
5.5 Bleeding
5.6 Process of manufacture of concrete

6. Concrete Operation :

6.1 Batching

6.1.1 Volume batching
6.1.2 Weight batching

6.2 Mixing

6.2.1 Hand mixing
6.2.2 Machine mixing

6.3 Transporting of concrete

6.3.1 Mortar pan
6.3.2 Wheel barrow
6.3.3 Bucket and rope way
6.3.4 Truck mixer and dumpers
6.3.5 Belt conveyors
6.3.6 Chute
6.3.7 Skip and hoist
6.3.8 Pumps and pipeline

6.4 Placing concrete
6.5 Compaction of concrete
6.5.1 Hand compaction
6.5.2 Compaction by vibrators
6.6 Types of vibrators and its uses
6.7 Curing of concrete
   6.7.1 Water curing
   6.7.2 Membrane curing
   6.7.3 Steam curing

6.8 Finishing
   6.8.1 Formwork finishes
   6.8.2 Requirements of good finish

6.9 Joints in concrete
   6.9.1 Construction joints
   6.9.2 Expansion joints
   6.9.3 Contraction joints
   6.9.4 Isolation joints

7. Strength of Concrete:
   7.1 Water cement ratio
   7.2 Gain of strength with age
   7.3 Relation between compressive and tensile strength
   7.4 Bond strength
   7.5 Aggregate cement bond strength

8. Special Concrete:
   8.1 Light weight concrete
   8.2 No fines concrete
   8.3 Aerated concrete
   8.4 High density concrete
   8.5 Fiber reinforced concrete
   8.6 Polymer concrete
   8.7 Gunite or shot concrete
   8.8 RMC (ready mixed concrete)
   8.9 Ferro cement
   8.10 High Performance concrete

9. Formwork:
   9.1 Requirements of formwork
   9.2 Types of formwork
   9.3 Time for stripping formwork

10. Quality Control at Site:
    10.1 Factors causing variations in the quality of concrete
    10.2 Field control
    10.3 Statistical quality control
    10.4 Frequency of test

11. Concrete Mix Design:
    11.1 Concept
    11.2 Variables in proportioning
    11.3 Indian Standard recommended method for concrete mix design IS10262-1982
12. **Deterioration and Restoration of Concrete**:

12.1 Introduction
12.2 Internal and external causes of deterioration of concrete
12.3 Prevention of deterioration of concrete.
12.4 Corrosion of reinforcing steel – causes & prevention.
12.5 Maintenance & repair –
   12.5.1 Repair materials – mortar, grouts, shotcrete, gunite, bonding agent, protective coating on concrete
   surface and protective coating on reinforcement
   12.5.2 Repair measures – assessment of damage, possible repair measures, structural strengthening
   12.5.3 Repair of cracks and honey combs.

**PRACTICALS**

1. Determination of specific gravity of cement.
2. Determination of consistency of cement
3. Determination of Initial and Final setting time of cement.
4. Determination of fineness of cement
5. Determination of soundness of cement
6. Determination of compressive strength of cement
7. Determination of specific gravity and water absorption of aggregates
8. Determination of fineness index and elongation index of aggregates
9. Determination of Bulk density of aggregates
10. Determination of fineness modules and grain size distribution
11. Determination of bulking of fine aggregate
12. Test for workability

12.1 Slump test
12.2 Compaction factor test
12.3 Vee-Bee test


**REFERENCE BOOKS**:

1. Concrete Technology
2. Concrete Technology
3. Concrete Technology
4. Concrete Technology (Hindi)
5. Concrete Manual

P.D. Kulkarni
M.S Shetty
Varshney
G. Das & B.L. Gupta
M.L. Gambhir

** * * **
PAPER - III BUILDING DRAWING

CODE DCC 403

CONTENTS

1. Detailed working plan, elevation and section of the following.
   1.1 Two bed room residential single story building with given direction (North, South etc)
   1.2 Three bed room duplex bungalow with the given plot size
   1.3 Detailed plan of above showing house drainage, water supply and electrical fittings as per BIS.
   1.4 Hostel building
   1.5 Primary health centre
   1.6 School building
   1.7 Panchayat bhawan
   1.8 Community hall
   1.9 Polytechnic college building
   1.10 Office building
   1.11 Fifty bed hospital at district headquarter

2. Drawing of a small residential building from measurements.
3. Detailed working plan, elevation and section through stair-case drawing of a two storied building.

REFERENCE BOOKS:

1. Civil Engg. Drawing
2. Building Drawing
3. Building Drawing

   Gurcharn Singh.
   Shah, Kala & Pataki.
   V. B. Sikka

* * * *

PAPER – II CONSTRUCTION MATERIALS AND EQUIPMENTS

CODE DCC 402

CC 402

1. Stones:
   1.1 Classification of rocks
   1.2 Geological classification - igneous rocks, sedimentary rocks and metamorphic rocks
   1.3 Chemical classification - argillaceous, siliceous and calcareous rocks
   1.4 Physical classification - unstratified, stratified, foliated rocks.
   1.5 Common rock forming minerals and their properties - silica, felspar, mica, hornblende and dolomite.
   1.6 Qualities of good building stone
   1.7 General characteristics, identification and uses of common building stones - granite, basalt, trap, sandstone, limestone, dolomite, marble, slate, quartzite.
   1.8 Natural bed of stones
   1.9 Seasoning of stones.

2. Bricks:
   2.1 Meaning and composition of brick
   2.2 Preparation of brick clay - weathering, kneading and tempering of clay
   2.3 Brief description and use of pug mill
   2.4 Standard size and shape of wooden and steel moulds
Civil Engineering

2.5 Moulding - ground moulding, table moulding, sand moulding and slop moulding, machine moulding, utility of frog.
2.6 Brief description and working of different types of kilns
2.7 Classification and testing of bricks as per B.I.S.

3. Tiles:

3.1 Use of tiles
3.2 Classification of tiles

3.2.1 According to use
3.2.2 According to shape
3.2.3 Special tiles - Allahabad tiles, Mangalore tiles

3.3 Preparation of clay
3.4 Moulding, shaping, drying and burning
3.5 Properties and uses of fire clay tiles.

4. Lime:

4.1 Introduction - lime, calcination, quick lime, slaking, setting, hardening, hydraulicity
4.2 Classification of lime as per B.I.S.
4.3 Manufacture of lime - process of charging, burning, collection and slaking.
4.4 Properties and uses of lime
4.5 Storage of lime
4.6 Testing of lime as per B.I.S.
4.7 Field test of lime as per B.I.S.
4.8 Pozzolanic materials as surkhi, cinder and fly ash.

5. Lime Mortar:

5.1 Constituents of lime mortar
5.2 Functions of sand and surkhi in lime mortar.
5.3 Preparation of lime mortar - mixing and grinding
5.4 Properties and common uses of lime mortar.
5.5 Constituents, function and properties of lime concrete

6. Cement and Cement Mortar:

6.1 Introduction
6.2 Raw material
6.3 Manufacturing process of ordinary Portland cement
6.4 Flow diagram for wet and dry process
6.5 Properties and use of ordinary Portland cement
6.6 Constituents, function and use of cement mortar

7. Timber:

7.1 Standing timber, rough timber, converted timber, exogenous trees, endogenous trees, softwood and hard wood.
7.2 Growth and general structure of exogenous trees
7.3 Seasoning of timber - natural and artificial
7.4 Conversion of timber by sawing
7.5 Common defects of timber and decay of timber
7.6 Preservation of timber
7.7 Qualities and uses of good timber
7.8 Manufacturing and uses of ply woods and different ply boards and laminated boards.
8. **Ferrous Material**:

8.1 Pig iron
8.2 Cast iron
8.3 Wrought iron
8.4 Steel
   8.4.1 Classification
   8.4.2 Heat Treatment
   Structural steel

8.5

9. **on Ferrous Metals**:

9.1 Aluminum
9.2 Copper
9.3 Zinc
9.4 Galvanized
9.5 Corrosion of Metals
   9.5.1 Mechanism and prevention

10. **Glass**:

10.1 Properties
10.2 Types of Glass
10.3 Industrial forms of glasses

11. **Paints and Varnishes**:

11.1 Classification of paints - oil paints, plastic paints, enamel paints, water paints and cement paints.
11.2 Constituent materials of paints
11.3 Preparation and uses of different paints
11.4 Constituents, properties and uses of varnish and polish - spirit polish and wax polish.
11.5 Different types and use of exterior paints

12. **Equipment for Earth Work and Compaction**:

12.1 Bull Dozers
12.2 Scraper
12.3 Loaders
12.4 Excavator
12.5 Shovels
12.6 Cranes
12.7 Static Compaction Equipment
12.8 Vibratory compaction equipment
12.9 Rubber tyred compaction equipment
12.10 Road Rollers

13. **Bitumen or Asphalt Mixing Plant**:

13.1 Hot mix plant
13.2 Cold Mix plant
13.3 Paver finisher
13.4 Bitumen distributors
13.5 Road Marking machine

14. **Hauling Equipment**

14.1 Different Types of dumpers
14.2 Trailors
15. **Equipment for Concreting**:

15.1 Concrete batching and mixing plant
15.2 Concrete mixer
15.3 Truck – mixers – transit truck mixers, truck agitators
15.4 Concrete pumps and dumpers
15.5 Concrete paver finishers

**PRACTICALS**

1. Identification of common rocks and minerals
2. Dimension, water absorption and efflorescence tests of bricks
3. Dimension, water absorption test of tiles
4. Field test of lime
5. Laboratory test of lime as per B.I.S.
6. Identification of common Indian timbers, plywood and laminated boards

**REFERENCE BOOKS**:

1. Construction Materials Sushil Kumar
2. Construction Materials Rangwala

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**CODE DCC 401**

**CC 401**

**PAPER – I COMPUTER AIDED DRAWING**

**RATIO ALE**

In the present scenario computer is becoming more and more important in every field. Computer software for drafting are widely used for drawing work. In this subject student will be given exercises to draw detailed drawings used in civil engineering.

**CO TESTS**

1. **Getting Started – I**
   - Starting AutoCAD – AutoCAD screen components – Starting a drawing: Open drawings, Create drawings (Start from scratch, Use a template & Use a wizard) – Invoking commands in AutoCAD – Drawing lines in AutoCAD – Co-ordinate systems: Absolute co-ordinate system, Relative co-ordinate system – Direct distance method – Saving a drawing: Save & Save As – Closing a drawing – Quitting AutoCAD

2. **Getting Started – II**
   - Opening an existing file – Concept of Object – Object selection methods: Pick by box, Window selection, Crossing Selection, All, Fence, Last, Previous, Add, Remove – Erasing objects: OOPS command, UNDO / REDO commands – ZOOM command – PAN command, Panning in real time – Setting units – Object snap, running object snap mode – Drawing circles

3. **Draw Commands**

4. **Editing Commands**
5. **Drawing Aids**
   - Layers – Layer Properties Manager dialog box – Object Properties: Object property toolbar, Properties Window
   - LTSCALE Factor – Auto Tracking – REDRAW command, REGEN command

6. **Creating Text**
   - Creating single line text – Drawing special characters – Creating multiline text – Editing text – Text style

7. **Basic Dimensioning**
   - Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centrelines, alternate units – Associative dimensions – Dimensioning methods – Drawing leader

8. **Inquiry Commands**

9. **Editing Dimensions**
   - Editing dimensions by stretching – Editing dimensions by trimming & extending – Editing dimensions: DIMEDIT command – Editing dimension text: DMTEDIT command – Updating dimensions – Editing dimensions using the properties window – Creating and restoring Dimension styles: DIMSTYLE

10. **Hatching**
    - BHATCH, HATCH commands – Boundary Hatch Options: Quick tab, Advance tab – Hatching around Text, Traces, Attributes, Shapes and Solids – Editing Hatch Boundary – BOUNDARY command

11. **Blocks**
    - The concept of Blocks – Converting objects into a Block: BLOCK, _BLOCK commands – Nesting of Blocks – Inserting Blocks: INSERT, MINsert commands – Creating drawing files: WBLOCK command – Defining Block Attributes – Inserting Blocks with Attributes – Editing Attributes

12. **Plotting Drawings in AutoCAD**
    - PLOT command – Plot Configuration – Pen Assignments – Paper Size & Orientation Area – Plot Rotation & Origin – Plotting Area – Scale

13. **Draw working plan, elevation of the following.**
    - 13.1 Three bed room duplex bungalow with the given plot size
    - 13.2 Detailed plan of above showing house drainage, water supply and electrical fittings as per BIS.
    - 13.3 Hostel building
    - 13.4 School building

**REFERENCE BOOK:**

1. AutoCAD for Windows Bible (with Applications) / Sham Tickoo / Galgotia Publications Pvt. Ltd.
2. Advanced AutoCAD Robert M. Thomas / Sybex BPD
3. AutoCAD Part – 1 & 2 Banglay Prokashito Tutorial / CD Media / Sonolite, 55, Elliot Road, Kolkata

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