



LEARNING RESOURCES

In First Year Engineering

Content List

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Engineering Chemistry (Chemistry of Engineering Materials)

Chapter 1: Atomic Structures

1. Introduction
2. Particles of matter
 - I. Molecule
 - II. Atom
3. Dalton's Atomic theory
4. Thomson's atomic model
5. Rutherford's Scattering Experiment
6. Drawback's of Rutherford's atomic model
7. Bohr's atomic model
8. Modern atom
9. Composition of Atom
10. Distinction between atomic number and Atomic mass number
11. Rules of distribution of electrons in shells
12. Energy levels and sub-energy levels
 - I. Distinction between Energy levels and sub-energy levels
13. Atomic orbital
 - I. Distinction between orbit and orbital
14. Quantum numbers
15. Pauli's exclusion principle, Hund's rule and Aufbau principle
16. Electron configuration of atoms
17. Electronic configuration of inert gas elements
18. Isotopes and Isobars
 - I. Isotopes
 - II. Isobars
 - III. Distinction between isotopes and isobars
19. Nuclear stability
20. Mass defect and binding energy
21. Electronic theory of valency
22. Lewis and Langmuir concepts of stable configuration
23. Concept of variable valency
 - I. Types of valency
 - II. Types of Electrovalency
24. Formation of electrovalent compounds
25. Properties of electrovalent compounds
26. Formation of covalent compounds
27. Properties of covalent compounds

Chapter 2: Electrochemistry

1. Introduction
2. Metallic and Electrolytic conductors
 - I. Metallic Conductors
 - II. Electrolytic conductor
 - III. Difference between the metallic and Electrolytic conduction
3. Atoms & Ions
 - I. Cations (Positive Ions)
 - II. Anions (Negative Ions)
 - III. Difference between the atoms and ions
4. Ionization and electrolytic dissociation
5. Arrhenius theory of electrolytic dissociation
6. Degree of Ionization
7. Significance of the terms involved in electrolysis
8. Mechanism of Electrolysis
9. Types of cells
 - I. Electrolytic Cell
 - II. Electrochemical Cell
 - III. Distinction between electrolytic cell and Electrochemical cell
10. Example of electrolysis
11. Net result of electrolysis
12. Faraday's laws of Electrolysis
 - I. Coulomb
 - II. Ampere
 - III. Faraday
 - a. First Law
 - b. Second Law
 - IV. Relation between Faraday and coulomb
13. Applications of Electrolysis
 - I. Electroplating
 - II. Electro refining
 - III. Electrotyping
 - IV. Electrometallurgy
14. Conductivity of Electrolyte
 - I. Ohm's Law
 - II. Conductance
 - III. Resistance
 - IV. Specific Conductivity
 - V. Equivalent Conductivity
 - VI. Measurement of Conductance
 - VII. Determination of Cell Constant
15. Common ion effect
 - I. Application of common ion effect
16. Solubility Product

- I. Relation between solubility and solubility product
- II. Application of solubility product

Chapter 3: Water

1. Introduction
2. Sources of water
 - I. Rain water
 - II. Surface Water
 - III. Ground water
3. Physical and Chemical characteristic of water
4. Common impurities in water
 - I. Suspended impurities
 - II. Dissolved impurities
 - III. Colloidal impurities
 - IV. Biological impurities
5. Hard and soft water
 - I. Causes of Hardness of water
 - II. Types of hardness
 - a. Temporary hard water
 - b. Permanent hard water
 - III. Degree of Hardness of water
 - IV. Calculation of degree of hardness
 - V. Effect/Disadvantage of hard water
 - a. For industrial use
 - Paper industry
 - Dyeing industry
 - Textile industry
 - Sugar industry
 - b. For domestic use
 - Washing
 - Cooking
 - Bathing
 - Drinking
 - c. For steam generation in boilers
 - Boiler Corrosion
 - Caustic embitterment (Caustic corrosion)
 - Priming and foaming
 - Scale and sludge formation in boiler
 - Scale formation in boilers
 - Sludge formation in boilers
 - Causes of scale and sludge formation
 - Disadvantage of scale and sludge formation
 - Removal of scales and sludge
 - Prevention of scale

6. Treatment of water
7. Methods of softening hard water
 - I. Boiling
 - II. Clark's Method
8. Methods of softening permanent hard water
 - I. Soda-ash process
 - II. Lime-Soda Process
 - III. Permutit Process
 - IV. Ion-exchange process (Deionization)
9. Requirements of drinking water.
10. Methods of Purification of water for domestic use
 - I. Screening
 - II. Sedimentation
 - III. Coagulation
 - IV. Filtration
 - V. Sterilization or removal of bacteria and its method
 - a. Boiling
 - b. Chlorination
 - c. Ionization
 - d. Aeration
 - e. Ultraviolet rays
 - f. Removal of algae
11. Sewage
 - I. Definition
 - II. Constituents of sewage
 - III. Characteristics of sewage
 - a. Physical characteristics
 - b. Chemical characteristics
 - c. Biological Characteristics
12. Biochemical Oxygen Demand
13. Sewage treatment
 - I. Objects of sewage treatment
 - II. Factors affecting sewage disposal
 - III. General method of purification of sewage
 - a. Aerobic Oxidation
 - b. Anaerobic oxidation
14. pH and pOH values
 - I. Application of pH measurements in engineering

Chapter 4: Metallurgy

1. Introduction
2. Characteristics of Metals
3. Mechanical properties of metal
 - I. Hardness
 - II. Ductility
 - III. Malleability
 - IV. Toughness
 - V. Brittleness etc
4. Metallurgy
 - I. Definition
 - II. Ore operations
 - a. Crushing or processing the ore
 - b. Concentration and its methods
 - Gravity separation
 - Electro-magnetic separation
 - Forth floating process
 - Calcinations
 - Roasting
 - c. Reduction and its processes
 - Smelting
 - Alumina thermic process
 - Electrolysis
 - d. Electrolytic refining
5. Importance of iron
6. Occurrence of Iron
7. Indian resources of iron
8. Manufacture of pig or cast iron
 - I. Blast furnace
 - II. Operation of Blast furnace
 - III. Properties and uses of cast iron
9. Steel
 - I. Classification of steel on the basis of CAK6ON content
 - II. Presence of other elements in steel
 - III. Heat treatment of steel
 - a. Purpose of heat treatment
 - b. Methods of heat treatment
 - Hardening or Quenching
 - Tempering
 - Annealing
 - Normalizing
10. Chemical properties of metals

Chapter 5: Alloys

1. Introduction
2. Preparation of alloys and its methods
 - I. Fusion
 - II. Electro-deposition
 - III. Compression
 - IV. Reduction
3. Purposes of making alloys
4. Classification of alloy steels
5. Application of alloy steels
 - I. Heat resisting steels
 - II. Magnetic steels
 - III. Shock resistant steels
 - IV. Stainless steels
 - V. High speed steels
 - VI. Spring steels
 - VII. Tool steels
6. Nonferrous alloys
7. Copper alloys
8. Aluminum alloys
9. Solders
10. Bearing alloys
 - I. Properties of bearing alloys
 - II. Important bearing alloys
 - III. Uses

Chapter 6: Corrosion

1. Introduction
2. Magnitude of corrosion problem
3. Types of corrosion
 - I. Atmospheric corrosion
 - a. Corrosion due to oxygen
 - b. Corrosion due to other gases
 - II. Immersed corrosion
4. Mechanism of Atmospheric corrosion
5. Factors affecting atmospheric corrosion
 - I. Impurities in the atmosphere
 - II. Moisture in the atmosphere
6. Role of metallic impurities in structures
7. Electrode potential
8. Standard hydrogen electrode
9. Concentration cell action
10. Factors affecting the rate of electrochemical corrosion

11. Methods used to protect metals from corrosion
 - I. Purification of metal
 - II. Alloy formation
 - III. Cathode protection
 - IV. Controlling the external conditions
 - V. Application of protecting coating
 - a. Inorganic Protective coating
 - Formation of oxide film
 - Formation of phosphate coating
 - Metal coating
 - b. Organic protective coating
12. Application of Galvanizing process
13. Tinning
 - I. Application of tinning process
14. Metal spraying
 - I. Application of spraying process
15. Cementation
16. Sherardizing
 - I. Application of sherardizing
17. Electroplating
 - I. Application of electroplating
18. Metal cladding
 - I. Application of metal cladding
 - II. Advantages
 - III. Disadvantages
19. Organic protecting coating

Chapter 7: Paints and Varnishes

1. Introduction
2. Purposes of applying paint
3. Characteristics of a good paint
4. Principal constituents of paint
 - I. Pigment
 - II. Vehicle or medium
 - III. Thinners
 - IV. Driers
 - V. Filters or extenders
 - VI. Plasticizers
5. Pigments
 - I. Definition
 - II. Types of pigments
 - a. White pigments
 - b. Colored pigments
 - III. Characteristics of good pigments
 - IV. Functions of pigment

6. Vehicle
 - I. Meaning
 - II. Functions of vehicle or medium
7. Thinners
 - I. Meaning
 - II. Functions of thinners
8. Drivers
 - I. Meaning
 - II. Functions of Drivers
9. Filters or Extenders
 - I. Meaning
 - II. Function of Extenders
10. Plasticizers
11. Methods of application of paints
 - I. Brushing
 - II. Spraying
 - III. Dipping
 - IV. Tumbling
 - V. Roller coating
12. Causes of failure of paint film
 - I. Chalking
 - II. Flaking
 - III. Cracking
 - IV. Blistering
 - V. Change of color of paint film (bleeding)
13. Prevention of failure of paint film
14. Varnishes
 - I. Definition
 - II. Types of varnishes
 - a. Oil varnishes
 - b. Spirit varnishes
 - III. Characteristics of good varnishes
 - IV. Uses of varnishes
15. Enamels
 - I. Definition
 - II. Constituents of enamels
 - a. Pigments
 - b. Vehicles
 - c. Drivers
 - d. Thinners

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2. Function of Lubricants
3. Types of Lubrication
 - I. Fluid film lubrication
 - II. Boundary lubrication
 - III. Extreme pressure lubrication
4. Classification of lubricants
 - I. Solid lubricants
 - II. Semisolid lubricants
 - III. Liquid lubricants
5. Selection of lubricants
6. Characteristics of lubricants
 - I. Physical Test
 - II. Chemical Test

Chapter 9: Fuels

1. Introduction
2. Classification of fuels
 - I. Solid Fuels
 - II. Liquid Fuels
 - III. Gaseous Fuels
3. Essential properties of fuels
4. Units of heat
5. Characteristics of good fuel
6. Selection of good fuel
7. Solid fuels
8. Types of coal
 - I. Peat
 - II. Lignite
 - III. Bituminous coal
 - a. Sub-bituminous coal
 - b. Semi-bituminous coal
 - IV. Anthracite coal

Chapter 10: Non-Metallic Material

1. Plastics
2. Polymerization
3. Formation of plastics by using following methods
 - I. Addition Polymerization
 - II. Condensation Polymerization
4. Structure of plastics
5. Types of plastics
 - I. Thermo softening
 - II. Thermosetting
6. Compound of plastics
7. Properties of plastics
8. Rubber
9. Types of rubber
 - I. Nature rubber
 - II. Synthetic rubber
10. Natural rubber
11. Drawbacks of natural (or raw) rubber
12. Vulcanization of rubber
13. Synthetic rubber
14. Important properties of synthetic rubber
15. Applications of rubber

Chapter 11: Pollution and its control

1. Introduction
2. Causes of pollution
3. Types of Pollution
 - I. Air pollution
 - II. Water pollution
 - III. Soil or land pollution
4. Air pollution
 - I. Introduction
 - II. Types of air pollutants
 - a. Gases
 - b. Particulates
 - c. Deforestation
 - d. Radioactive gases
 - III. Control of air pollution
 - IV. Air pollution due to internal combustion engines
5. Water Pollution
 - I. Introduction
 - II. Causes of water pollution
 - III. Methods of preventing water pollution
6. Oxidation method

Engineering Physics

Chapter 1: Simple Harmonic Motion

1. Periodic Motion
2. Simple Harmonic Motion (S.H.M)
 - I. Linear S.H.M
 - a. Explanation of L.S.H.M
 - b. Characteristics of L.S.H.M
 - II. Equation of S.H.M or Displacement in S.H.M
 - III. Viscosity in S.H.M
 - IV. Acceleration in S.H.M
 - V. Graphical representation of S.H.M
 - VI. Important terms used in S.H.M
3. Concept of Wave motion
4. Relation between Velocity, Frequency and Wavelength
5. Transverse wave and its characteristics
6. Longitudinal wave and its characteristics
7. Equation of Progressive wave
8. Stationary wave
9. Nodes and Antinodes
10. Free and forced oscillation
11. Resonance with example
12. Harmonics in a closed pipe
13. Velocity of sound by resonance tube method

Chapter 2: Gas laws and Specific heat of gases

1. Introduction
2. Gas Laws
 - I. Boyle's Law
 - II. Charle's Law
 - III. Guy Lussat's Law
3. Gas equation and universal gas constant
4. Concept of absolute zero and absolute scale of temperature
5. Expression for work done in expanding a gas at constant pressure
6. Specific heat of gases
7. Adiabatic and Isothermal changes (Expansion)
8. Application in heat engines or Thermodynamics

Chapter 3: Principle of electrical circuit

1. Introduction
2. Ohm's Law
3. Specific Resistance
4. Combination of resistance
 - I. Resistance in series
 - II. Resistance in parallel
5. Shunt and its theory
6. Whetstone's Network
7. Application of Whetstone's network
8. Post Office box (P.O.Box)
9. Potentiometer principle of potentiometer
10. Potential Gradient
11. Laboratory experiment to verify principle of potentiometer
12. Internal resistance of a cell
13. Temperature coefficient of resistance
14. Platinum resistance thermometer
15. Effect of temperature variations on resistance and resistivity of conductor and insulator

Chapter 4: NDT Materials

1. Introduction
2. Ultrasonic with their properties
3. Essentials of NDT system
4. Ultrasonic Inspection
5. Radiography
6. Analysis of radiography
7. Liquid penetrate Inspection
 - I. Principle
 - II. Working
8. Recent development in NDT
9. Application of NDT
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Chapter 5: Photoelectricity

1. Introduction
2. Planck's quantum theory
3. Experiment to study of Photoelectric effect
4. Characteristics of Photoelectric effect
5. Important Definitions
6. Photoelectric cell
 - I. Principle

- II. Types
 - a. Photoemissive cell
 - b. Photoconductive cell
 - c. Photovoltaic cell
- 7. Photomultiplier Tube
- 8. Application of Photoelectric cell

Chapter 6: Sound

- 1. Introduction
 - I. Sense of Hearing
 - II. Characteristics of sound
- 2. Absorption, transmission and reflection of sound and their coefficient
- 3. Relation between coefficients of absorption, coefficient of reflection and coefficient of transmission
- 4. Loudness and intensity of sound
- 5. Graph of Loudness verses Frequency
- 6. Acoustics
- 7. Echo
- 8. Reverberation
- 9. Requirements of satisfactory acoustics
- 10. Sound pollution (noise)
 - I. Effects of sound noise
 - II. Sources of noise
 - III. Noise control

Chapter 7: Photometry

- 1. Introduction
- 2. Important Definitions
- 3. Laws of Illumination
 - I. Lambert's cosine law
 - II. Inverse square law
- 4. Principle of Photometry
- 5. Indoor lighting system
 - I. Concept
 - II. Types of Indoor lighting system
 - a. Directing lighting system
 - b. Indirect lighting system
 - c. Semi-indirect lighting system
 - III. Efficiency of the source
 - IV. Maintenance factor
 - V. Applications of illumination or lighting system

Chapter 8: Refraction of Light

1. Introduction
2. Law of refraction
3. Refraction through glass prism
4. Prism formula
5. Determination of refractive index of prism by pin method
6. Dispersive power
7. Determination of dispersive power using spectrometer
8. Total internal reflection
9. Fibre optics
 - I. Types of fibre optics
 - a. Step index fibre
 - b. Graded index fibre
 - II. Losses in fibres
 - III. Application of optical fibre

Chapter 9: Conduction of heat and expansion

1. Introduction
2. Modes of transfer of heat
 - I. Conduction
 - II. Convection
 - III. Radiation
3. Conduction of heat along a bar (Metal rod) steady state
4. Thermal conductivity and coefficient of thermal conductivity
5. Factors affecting the conduction of heat
6. Coefficient of Thermal Conductivity
7. Temperature Gradient
8. Applications
9. Conductor
10. Bar conductor
11. Expansion in solids
12. Types of coefficient of expansion
 - I. Coefficient of linear expansion (Alpha)
 - II. Coefficient of Aerial expansion (Beta)
 - III. Coefficient of Cubical expansion (Gama)

Chapter 10: Viscosity

1. Introduction
2. Velocity gradient
3. Newton's law of viscosity
4. Poiseuille's Method
5. Stoke's law

- I. Derivation of 'n' by Stoke's method
- II. Stoke's experiment to determine coefficient of viscosity of a liquid
6. Flow of liquid through a tube-streamline flow and Turbulent flow
7. Significance of Reynold's number
8. Applications of viscosity

Chapter 11: Surface Tension

1. Introduction
2. Important definitions
 - I. Adhesive Force
 - II. Cohesive Force
 - III. Sphere of influence
3. Molecular theory of surface tension
4. Surface tension and Surface energy
5. Angle of contact ant its significance
6. Capillarity or capillary action
7. Surface tension by rise of liquid in a capillary
8. Effects of impurity and temperature on surface tension of liquid
9. Application of surface tension

Chapter 12: Elasticity

1. Elasticity, Plasticity and Rigidity
2. Concepts related to elasticity
3. Stress and Strain
 - I. Types of strain
 - a. Tensile strain
 - b. Volume strain
 - c. Shearing Strain
 - II. Types of stress
 - a. Tensile stress
 - b. Volume stress
 - c. Shearing stress
4. Elastic limit and Hooke's law
5. Types of Modulus of Elasticity
 - I. Young's modulus
 - II. Bulk modulus
 - III. Modulus of rigidity
6. Poisson's ratio
7. Behavior of wire under continuously increasing load
8. Factor of safety
9. Applications of Elasticity

Chapter 13: Electromagnetism

1. Introduction
2. Coulomb's inverse square law of magnetism
3. Oersted's Experiment
4. Magnetic effect of electric current
5. Direction of magnetic field and current
 - I. Ampere's right hand rule
 - II. BiotSavart's law
6. Force acting on current carrying conductor placed in Magnetic field
7. Direction of force on conductor in a magnetic field
 - I. Fleming's Left hand rule
8. Principle of Galvanometer
9. Moving coil Galvanometer
 - I. Principle
 - II. Construction
 - III. Working
 - IV. Uses of different part
10. Ammeter
11. Voltmeter
12. Expression for intensity of magnetic field
13. Magnetic induction due to long straight conductor

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1. Introduction
2. Seebeck's effect
3. Peltier effect
4. Law of intermediate temperature
5. Law of intermediate metals
6. Thermocouple and variation of thermo EMF with temperature
7. Thermocouple as a thermometer
 - I. Concept
 - II. Advantages

Chapter 15: Heating effect of electric current

1. Introduction
2. Joule's law
3. Electrical Energy
4. Electrical Power
5. Calculation of Electrical Energy

Chapter 16: Capacitance

1. Introduction
2. Unit and definition of Farad
3. Principle of Condenser

4. Capacity of parallel plate condenser
5. Factors affecting capacitance of a condenser
 - I. Area of Plates
 - II. The dielectric
 - III. The distance between the plates
6. Combination of Capacitance
 - I. Series combination and expression for effective capacitance
 - II. Parallel combination and expression for effective capacitance

Chapter 17: Electric potential

1. Introduction
 - I. Potential of Charge
 - II. Electric Potential
2. Potential difference between two points due to a charge
3. Absolute potential of a point
4. Potential of a sphere
5. Potential of Earth

Chapter 18: Electrostatics

1. Introduction
2. Coulomb's law
3. Electric field
 - I. Intensity of Electric field
4. Electric lines of force
 - I. Properties of Electric lines of force
5. Electric flux

Chapter 19: Physical Instrument

1. Introduction
2. Units
 - I. Types of Units
 - a. Fundamental units
 - b. Derived units
3. Rules and conventions
4. System of units
5. International system of units
6. Dimensions of physical quantity
7. Presentation of physical quantity
8. Errors in measurement
 - I. Types of errors
 - a. Instrumental or constant errors
 - b. Systematic errors
 - c. Random errors

- II. Procedure to minimize errors
- 9. Significant figures
 - I. Number of significant figures
 - II. Rules for calculation with significant figure
- 10. Measuring Instruments
- 11. Determination of zero error
 - I. Procedure
- 12. Measurement of length using micrometer screw gauge

Chapter 20: Revision

- 1. Introduction
- 2. Basic terms
 - I. Mass
 - II. Time
 - III. Area
 - IV. Volume
 - V. Density etc
- 3. Related laws
 - I. Newton's laws of motion
 - a. First law
 - b. Second law
 - c. Third law
 - II. Archimede's principle
 - III. Kinematical equations
- 4. Graph
 - I. Line and axes
 - II. X and Y axes in a Plane
 - III. Co-ordinates of a point on the graph
 - IV. Dependent and independent variable
 - V. Scale, plotting graph and interpretation of straight line passing through origin and slope
 - VI. Slope

Elements of Civil Engineering

1.	Introduction to Civil Engineering
	<p>Introduction Branches of Civil Engineering Transportation Engineering Environmental Engineering Applications of Civil Engineering to allied fields Mechanical Engineering Constructions Electrical Engineering Constructions Role of Civil Engineer in various construction activities Specific application in Industrial building Transmission Towers Chemical plants Foundation for antenna towers</p>
2.	Linear & Angular Measurement
	<p>Chain & Cross staff surveying Principle of Chain Surveying Technical Terms Selection of survey station Offsets Measurement of perpendicular offsets Taking offsets Number of offsets Limiting length of offsets Locating corners, point of intersection & buildings Error due to incorrect ranging Filed book Field work for chain survey Instruments for setting out right-angles Principle of optical square Indian optical square Obstacles in chaining Obstacles which obstruct both ranging & chaining Cross staff survey Plotting a chain survey Chain & Compass survey Chain traversing Adjustment of surveying compass True meridian True bearing Calculations of included angles from bearings Calculations of bearings from included angles</p>

	<p>Local attraction Magnetic declination Traversing with chain and compass Plotting of traverse Errors in compass surveying</p>
3.	<p>Vertical Measurement</p>
	<p>Leveling Principal of leveling Some important definitions Instruments for leveling The surveying telescope Some important points Bench marks Essential steps in leveling Principle of leveling Simple leveling Differential leveling Booking & reduction of the levels Rise & fall system Difficulty in leveling due to obstruction of wall Classification of leveling Method of cross sectioning Method of reciprocal leveling Precise leveling Curvature correction Refraction correction Distance to visible horizon Three wire leveling Difficulties in leveling Errors in leveling Sensitiveness of a level tube Principle of reversal Fundamental lines of level Adjustment of dumpy level Adjustment of a tilting level Barometric leveling The mercurial barometer</p>
4.	<p>Measurement of area</p>
	<p>Introduction Units of area Computation of areas from filed notes Areas between the survey line & boundaries Determinations of areas from plans Determination of area between a straight line Mid-ordinate rule Average ordinate rule</p>

	<p>Trapezoidal rule Simpson's rule Planimeter Zero cycle of planimeter Practical method of using a planimeter</p>
5.	<p>Modern electronic equipments</p>
	<p>Electromagnetic waves and their properties Phase of the wave Phase comparison Geodimeter Tellurometer Tunnel / alignment lasers Electromagnetic distance meter Distomat Total station</p>
6	<p>Land development, environment protection & other ACTs</p>
	<p>Introduction The M.R. and T.P.ACT 1966 The maharashtra housing and area development ACT The Bombay metropolitan regional development The land acquisition ACT 1894 The urban land ACT 1976 Transfer of development right Environmental protection Act1986 Power to central government Power to give directions Control and abatement of environmental pollution Powers of entry and inspection Penalty for contravention of the provisions of ACT</p>
7.	<p>Material of constructions</p>
	<p>Classification of building stones Requirement of a good building stone Quarrying of stones Methods of quarrying Effect of quarrying on environment Building stones in maharashtra /granite Dressing of stones salt Types of dressing Bricks and other clay products Preparation of clay or brick –earth Classification of burnt clay brick Properties of bricks Tiles</p>
8.	<p>Foundations</p>

	<p>Bearing Capacity of Soils Field methods for determination of bearing capacity Limitations of plate load test Shallow foundations Deep Foundations Common types of deep foundation Under-reamed piles Form work needed for foundation Timbering of the sides of trenches Perimeter trench method Drainage from foundation soil</p>
9.	<p>Building planning</p>
	<p>General Principles Comfortable conditions for Humid tropics Comfortable conditions for Dry tropics Orientation Protection of Walls from sun & rain Walls and openings protection from sun and rain Chajjas and sun breakers Air temperatures Ground treatment with vegetation Open Space In Layout Plots in Layouts For Industrial Zone Plots in Layouts For Residential Zone Roads in Layouts For Industrial Areas Roads in Layouts For Residential Areas Marginal distance for Industrial Areas Marginal distance for Residential Areas Marginal distance for Residential Areas(Non-Gaothan) marginal distance for Group housing scheme Marginal distances Balconies and overhangs Bathrooms and W/C's Compound Wall Staircase Area Of The Room Area Of The Room(Non-Gaothan Area) Community halls and public buildings Drama houses and cinema theatres Health centre Hospitals Schools and Other educational centers Carpet Area Floor Area Plinth Area</p>
10.	<p>Environmental pollution</p>

	<p>Introduction Environment And Pollution of Environment Transportation Engineering Types of Pollution Air Pollution Effects of Air Pollution Green house effect Water Pollution Sewage and Domestic Waste Types of Water Pollution Characteristics of Sewage Biochemical Oxygen Demand Effects of Water Pollution Control of Water Pollution Solid Waste Management Methods of Disposal Noise Pollution Thermal Pollution Anthropogenic Sources of Radiation Effects of Radio active Pollution</p>
11.	Energy & Environment
	<p>Introduction Impact of Environment Non-Conventional Energy Sources Wind Power Geothermal Energy Tidal Power Solar Power Biomass Energy Instruments used for carrying out the water analysis... Turbidity Meter Nephelometer Photoelectric Colorimeter Spectrophotometer Atomic Absorption Spectrophotometer Flame Photometer Gas Chromatograph</p>

Elements of Mechanical Engineering

1.	Introduction
	Sources of Energy Non Conventional Energy Sources Wind Energy Tidal Energy Geothermal Energy Biaogas Plant Prime Movers Two Stroke Petrol Engine Force Pressure Power Work Energy Convection Change of state Mechanical Equivalent of Heat
2.	Fuels and combustion
	Introduction Classification Solid Fuels Liquid Fuels Gaseous Fuels Combustion Calorific Values
3.	Properties of gases
	Non Flow Process Boyle's Law Charle's Law Guy Lussat's Law Isochoric Process Adiabatic and Isothermal changes Polytropic Process Internal Energy Specific Heat of Gases
4.	Properties of steam
	Introduction Steam Formation Enthalpy Properties of Steam Steam Tables Internal Energy Non-Flow Process

	Throttling Calorimeter Separating Calorimeter Combined Calorimeter
5.	Heat engines
	<ul style="list-style-type: none"> • Heat Engines • Heat Reservoirs • Classification of Heat Engines • Heat Engine Cycles • Ranking Cycle • Otto or Constant Volume Cycle • Diesel Cycle • Dual Combustion Cycle
6.	Steam boilers
	<ul style="list-style-type: none"> • Introduction • Classification • Simple Vertical Boiler • Vertical Multitubular Boiler • Marine Boiler • Lancashire Boiler • Locomotive Boiler • Babcock and Wilcox water tube boiler • High pressure boilers • Boiler mountings • Boiler Accessories
7.	Internal combustion engines
	<ul style="list-style-type: none"> • Introduction • Classification • Engine Details • Otto Four-Stroke Cycle • Diesel-Four-Stroke Cycle • Two-Stroke Cycle SI Engine • Two strokes CI engine • Difference Between Two-Stroke & Four-Stroke • Efficiencies
8.	Speed control
	<ul style="list-style-type: none"> • Types of Governors • Governors of Steam Engine • Governing of I.C. Engine • Flywheel
9.	Pumps
	Introduction Reciprocating Pump Centrifugal pump

	<ul style="list-style-type: none"> Types of Centrifugal Pump Priming Rotary Pumps External Gear Pump Internal Gear Pump Lobe Pump Vane Pump
10.	Air compressors
	<ul style="list-style-type: none"> Introduction Classification Working Mechanical efficiency Rotary Compressor Types of Rotary Air Compressors Centrifugal Compressor Axial Flow Compressors
11.	Refrigeration & air conditioning
	<ul style="list-style-type: none"> Introduction Refrigerant Vapour compression refrigeration cycle Types of Refrigerators Domestic Refrigerator Window Air Conditioners
12.	Couplings, clutches and brakes
	<ul style="list-style-type: none"> Introduction Couplings Clutches Brakes Types of Brakes Internal Expanding Shoe Brake
13.	Transmission of motion and power
	<ul style="list-style-type: none"> Shafts Power Transmission Devices Types of Belts/Ropes Belt drives Velocity Ratio Chain drives Gear & Gear Trains Friction Wheels Types of Gears Gear Trains Sliding Mesh type of Gear Box Bearings

Elements of Electrical Engineering

Chapter	Topics
Ch-1 Basic concepts of electrical engineering	Structure of an atom, Recalling concept of V, R, & I, Ohm's law, Concept of current (D.C. /A.C.), Effects of an electric current, Concept of voltage, Concept of resistance, Laws of resistance, Specific Resistance or resistivity, Conductance & specific conductance, Conductor semiconductor & insulator.
Ch-2 Sources of electrical energy	Electrical energy applications, Energy sources, Fossil fuels, Water, Nuclear fuels, Sun, wind, Ocean tides & Wave, Geothermal sources, Introduction to supply system, Single phase & three phase system, Star & delta connection, Comparison of star & delta connection, Comparison of single phase & 3 phases.
CH-3 Storage batteries	Faraday's law of electrolysis, Lead acid battery, Plante process, Faure process, Internal resistance and capacity of a cell, Electrical characteristics of the lead acid cell, Voltage regulators, End-cell control system, Constant-current system, Constant-voltage system, Alkaline batteries, Nickel-iron or Edison batteries, Nickel-cadmium batteries, Silver-zinc batteries.
Ch-4 Electrical circuit components	Commonly used wiring components, Wire, Lamp holder, Switches, Ceiling rose, Plugs & sockets, Distribution box, Fuses > Rewirable, HRC, Connector blocks, Adaptors.
Ch-5 Types of electrical circuits	Series circuit of resistors, Parallel circuit of resistors, Current & voltage distribution, Kirchhoff's laws, Application of Kirchhoff's laws, Star delta & delta star transformation.
Ch-6 Electrostatics	Laws of electrostatics, Concept of capacitor formation, Capacitance, Types of capacitor, Definitions, Permittivity, Capacitance of parallel plate capacitor, Capacitors in series, Capacitors in parallel.
Ch-7 Capacitors	Energy stored in a capacitor, Charging of a capacitor, Discharging of a capacitor.
Ch-8 Magnetic circuits	Review of concept of magnetism, Permeability, Concept of electromagnetism, Magnetic circuits, Magnetic leakage, leakage coefficient, Series magnetic circuits, Parallel magnetic circuits.
Ch-9 Electromagnetism	Field due to current carrying straight Conductor, Rules-indicating the direction of field, MMF & magnetic field strength of a long straight conductor, Solenoid, Force on a current carrying conductor, Magnetization curve, Concept of hysteresis & hysteresis loss, Lifting magnets & applications.

Ch-10 Electromagnetic induction	Faraday's laws of electromagnetic induction, Types of induced emf, Rise & decay of current in an inductive circuit, Mathematical expression for current at any instant during its decay in an inductive circuit, Mutually induced emf, Inductances in series, Inductances in parallel.
CH-11 AC Fundamentals	Generation of alternating current & voltage, Difference between AC & DC, Some important terms, Equations of alternating voltages & currents, RMS value of sinusoidal current or voltages, Average value of sinusoidal current or voltage, Peak factor & form factor, Phasor representation of alternating quantities.
CH-12 AC circuits	Purely resistive AC circuit, Purely inductive AC circuit- inductive reactance, Purely capacitive AC circuit- capacitive reactance, AC series circuits, AC circuit with resistance & inductance in series, AC circuit with resistance & capacitance in series, AC circuit with resistance, inductance & capacitance in series.
CH-13 Three phase circuit	Polyphase systems & their advantages, Generation of three phase voltages, Three phase supply systems, Balanced load, Balanced system; Voltage, current & power relations in a star connection, Voltage, current & power relations in a delta connection; Apparent power & reactive power, Applications of star & delta connections.
Ch-14 Domestic Appliances	Classification, Heating appliances, Water heater, Electric segari or stove, Electric irons, Electric bells.

Engineering Drawing

Part I	
Ch:1 Lines, Lettering Dimensioning & Scales	Drawing Board, T- square, Set- square, Drawing instrument box, Scales Protractor, French curves, Drawing papers, Drawing pencils, Sand paper block, Eraser (Rubber), Drawing pins, Duster, Drafting machine
Ch:2 Orthographic Projections and Interpretation of Given Views	Principal plane, Frontal plane, Horizontal plane, Profile plane
Ch:3 Isometric Projections	Isometric lines, projections, planes, Isometric scale, Isometric graph, Drawing an object using graph
Ch:4 Curves Used, Engineering Practice and Loci of Points	Rectangle oblong method, Concentric circle method, Arcs of circles method
Part II	
Ch:1 Projection of Points & Lines	Object: lines, Projection on vertical plane, Projection on horizontal plane
Ch:2 Projection of Planes	Object: Plane, Projection on vertical plane, Projection on horizontal plane
Ch:3 Projection of solids	Object: Square, Projection on vertical plane, Projection on horizontal plane

Ch:4 Selection of Solids	Full selection, Half selection, Offset selection, Revolved selection
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