



Basic Civil Engineering

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SECTION I

Unit 1: Relevance of Civil Engineering and Building Planning

Introduction, branches of civil engineering, application of civil engineering in other allied fields. Principles of planning, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit 2: Components of Building

A) Sub-structure: Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.

B) Super-structure: Elements of super-structures and their functions

Unit 3: Building Materials and Design

Use and properties of the following materials--Concrete - ingredients and grades, plain and reinforced cement concrete and ready mix concrete, bricks, steel, timber, roofing materials etc.

Introduction to types of loads, load bearing and framed structures.

SECTION II

Unit 4: Linear and Angular Measurements

Principles of surveying, Classification of surveys, Chain Surveying, Introduction to metric chain and tapes, error in chaining, nominal scale and R.F., ranging, chaining and offsetting, index plan, location

sketch and recording of field book, Chain and compass survey, Meridian, bearing and its types, system of bearing, Types of compass: prismatic and surveyor's compass. Calculation Of included angles, correction for local attraction.

Unit 5: Leveling

Terms used in leveling, use of Dumpy level and Auto Level, temporary adjustments. Methods of reduction of levels, types of leveling, Contours, characteristics of contours, use of contour maps. Introduction and use of EDM's with special reference to Total Station. Measurement of area by planimeter - mechanical and digital.

Unit 6: Introduction to Transportation, Environmental and Irrigation Engineering

Components of rigid and flexible pavement, components of railway track (Broad Gauge) Components of water supply scheme (flow diagram), Necessity of Irrigation, Types of Dams (Earthen and Gravity Dam)

Reference Books:

1. Basic Civil Engineering by S. S. Bhavikatti, New Age International Publications.
2. Civil Engineering Materials - Technical Teacher's Training Institute, Chandigarh
3. Surveying by N. Basak, Tata Mc-Graw Hill Publication.
4. Basic Civil Engineering by G. K. Hiraskar, Dhanpat Rai Publication.
5. Surveying Vol.I, Vol.II, Vol.III by B.C. Punmia, Laxmi Publication.
6. Irrigation Engineering by B. C. Punmia, Dhanpat Rai Publications

Engineering Chemistry

Unit 1: Water

Introduction, impurities in natural water, water quality parameters total solids, acidity, alkalinity, chlorides, and dissolved oxygen (definition, causes, significance), hardness of water types of hardness, units of hardness, ill effects of hard water in steam generation in boilers (scale & sludge formation), numerical on hardness, treatment of hard water (ion exchange and reverse osmosis).

Unit 2: Instrumental methods of chemical analysis

Introduction, advantages and disadvantages of instrumental methods-

A) Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's law), Single beam spectrophotometer (schematic, working and applications).

B) Chromatography: Introduction, types, gas-liquid chromatography (GLC), basic principle, instrumentation and applications.

Unit 3: Advanced materials

A) Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers and Biopolymers(Introduction, examples and applications.)

B) Composite materials: Introduction, Composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).

SECTION II

Unit 4: Fuels

Introduction, classification, calorific value, definition, units (calorie, kcal, joules, kilojoules), characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numerical problems on Bomb and Boy's calorimeter.

Unit.5: Corrosion:

Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection, cathodic protection, Protective coatings- hot dipping (galvanizing and tinning,), electroplating.

Unit 6: Metallic materials & Green Chemistry

A) Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys.

Ferrous alloys: Plain carbon steels (mild, medium and high), stainless steels. Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).

B) Green Chemistry: Definition, Twelve principles of Green Chemistry.

Fundamentals of Electronics and Computer Programming

Unit 1: Semiconductor Devices and Applications

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Semiconductor Diode, Half wave, Full wave, Bridge rectifier, Voltage Regulator Using Zener

Diode, BJT: characteristics, CE configuration, CE as an amplifier. Load Line, Operating Point, Leakage

Currents, Saturation and Cut off Mode of Operations.

Unit 2: Digital Electronics

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Logic Gates, Boolean algebra, Comparison of Specifications of Logic Families, Combinational Logic,

Half Adder, Full Adder, Multiplexer, De-Multiplexer.

Unit 3: Applications

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Transducers: for Displacement (LVDT), Temperature (RTD), Pressure (Strain Gauge), Speed (Shaft Encoder), Range, Specifications and Limitations.

B) Appliances: Operation of Appliances: Digital Thermometer, Weighing Machine, Washing Machine, Microwave Oven and Tachometer.

SECTION II

Unit 4: Computer Basics and Hardware

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Generations & Classification of Computers.

B) Computer System Architecture- CPU, Input Unit, Output Unit, Storage Unit.

C) Applications of Computers.

Unit 5: Data Representation and Computer Software

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

A) Data Representation In Computer: Types Of Number System - Binary, Octal, Decimal, Hexadecimal & Their Conversions, Coding Schemes - ASCII, Unicode.

B) Computer Software:

A) Operating System: Types Of Operating System, Functions,

Unix/Linux Commands: Listing, Changing, Copying, And Moving Files & Directories (ls, cd, cat, mkdir, rmdir)

B) System Software: Assembler, Interpreter, Compiler.

C) Application Software's: Word Processor, Spreadsheets, Presentation and their Applications.

Unit 6: Computer Programming and Networks

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Computer Programming: Program Development Cycle, Algorithm, Flowchart, Programming Control Structures - Sequence, Selection, and Repetition.

B) Introduction to Computer Networks: Definition Of Computer Network, Need, Standards: OSI, TCP/IP, Types of Networks: LAN, WAN, MAN, Network Topologies.

Applied Mechanics

Unit 1: Fundamentals of Statics

Basic Concepts and Fundamental Laws, Force, Moment and Couple, System of Forces, Resultant, Resolution and Composition of Forces, Varignon's Theorem, Law of Moments.

Unit 2: Equilibrium

Lami's Theorem, Free Body Diagram, Equilibrium of Forces, Equilibrium conditions, Surface friction for bodies on horizontal and inclined planes.

Beams: Types of Loads, Types of supports, Analysis of Simple beams, Virtual work method for support reactions.

Unit 3: Centroid and Moment of Inertia

Centroid and Center of Gravity, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.

SECTION II

Unit 4: Kinetics of Linear

Introduction to Kinematics of Linear motion (no numerical on kinematics), Kinetics of linear motion, Newton's Laws, D'Alembert's Principle, Work- Energy Principle, Impulse Momentum Principle

Unit 5: Kinetics of Circular Motion

Introduction to Kinematics of Circular motion (no numerical on kinematics), Rotation with

constant and variable angular acceleration, centripetal and centrifugal force, condition of skidding and overturning.

Unit 6: Impact and Collision

Impact, Types of Impact, Law of conservation of Momentum, Coefficient of Restitution, Numerical on Direct central Impact.

Basic Mechanical Engineering

Unit 1: Thermodynamics

Thermodynamic State, Process, Cycle, Thermodynamic System, Heat, work, Internal Energy, First Law of Thermodynamics, Application of First Law to steady Flow processes, Limitations of First Law (Numerical Treatment) Statements of Second Law of Thermodynamics. (12 marks)

Unit 2: Introduction to I C Engine

Carnot Engine, Construction and Working of C.I. and S.I., Two stroke, Four Stroke Cycles, Air standard cycles- Carnot Cycle, Joule Cycle, Otto Cycle, Air Standard efficiency (Descriptive Treatment only) (12 marks)

Unit 3: Introduction to Refrigeration and Air Conditioning

Carnot refrigerator, Refrigerant types and properties, Vapour compression and vapour absorption system, solar refrigeration, Window Air Conditioning, Psychometric properties of moist air, Applications of refrigeration and air conditioning (Descriptive Treatment only). (11 marks)

Unit 4: Energy Sources and power plants

Renewable and nonrenewable, Solar-flat plate collector, concentric collector-Parabolic and cylindrical, Photovoltaic cell, Wind, Hydropower plant, Steam Power plant, Bio-gas, Bio-Diesel (Descriptive Treatment only). (12 marks)

Unit 5: Mechanical Power Transmission and Energy conversion devices

Type of Belt and belt drives, chain drive, Types of gears and gear Trains, (Numerical Treatment on belt

drive), Construction, working and applications of centrifugal Pump, Reciprocating compressor and Peloton wheel Turbine.(12 marks)

Unit 6: Manufacturing Processes

Introduction to manufacturing processes - Casting Process, Steps involved in casting processes, and their applications, Metal removing processes (Lathe, milling & drilling operations) Metal Joining Processes - Arc welding, soldering and brazing and their applications.(11 marks)

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