

## CIVIL ENGINEERING

(Including Civil Engg, Civil Engg Draughtsmanship & Construction Technology)

**Group Code: CE**

**Max Marks 100**

### **1. Civil Engineering Materials**

**08**

Stones - Classification of rocks, properties of stone, quarrying of stones.

Bricks - Manufacturing process, types, tests.

Cement - Composition, types, tests, uses.

Timber - Classification, defects, preservation, seasoning, market forms of timber.

Metals - mild steel, copper, aluminum alloy, steel alloy.

Fine & Coarse Aggregates - Sources, functions, properties, bulking of sand, tests.

Mortar & Concrete - Grade, batching, mixing, properties.

Paints, varnish & distemper - Ingredients, types

Miscellaneous Materials - Properties & uses of Glass, Plastic, Water proofing compounds, FRP, Geo-text tiles.

### **2. Construction Technology**

**10**

Types of foundation & suitability, SBC of soil, Technical terms in Brick & stone masonry, Types of damp proofing materials, types of Doors & windows, fixtures for doors & windows, Lintel & arches, Scaffolding, shoring & under pinning, Technical terms in stair, types of stairs, Types of roof, Plastering & pointing, types of floors, Ventilation.

### **3. Surveying**

**12**

Chain surveying- Types of survey, principles of survey, ranging, offsets, instruments for setting perpendiculars, errors in chain surveying.

Compass survey – Bearing, meridian, system of bearing, prismatic & surveyor compass, dip, declination, local attraction, open & closed traverse.

Leveling - Terms in leveling, Bench mark, types of leveling, L/S, C/S, contouring computation of area, volumes, minor instruments.

Theodolite surveying – measurement of horizontal & vertical angles, deflection angle, latitude, departure, Bowditch's & Transit rule.

Trigonometric leveling – height & distance for different cases.

Tacheometry – definition, stadia, system of tacheometry.

Curves- types, elements of curve, designation, setting out curves, GIS, GPS, remote sensing, Modern survey instruments.

### **4. Strength of materials**

**12**

Engineering Mechanics – Force system, Characteristics, resolution, moment & Couples.

Sectional properties such as Centre of gravity, Moment of Inertia, radius of gyration, Parallel & Perpendicular axis theorem.

Stress & strain – Types of stress, Hook’s law, factor of safety, lateral & linear strain, strain energy, stress strain diagram for mild steel.

Bending moment & Shear force – Types of supports, types of beam, Shear force & Bending Moment Calculation for cantilever, Simply supported & Over hanging beam with point load & UDL, Point of contra flexure.

Simple Bending – bending stress, equation, flexural rigidity, section modulus, modulus of rupture.

Slope & Deflection – definition of slope, deflection & curvature, calculation of Slope & deflection for cantilever, Simply supported beams with point load & UDL(moment area method).

Columns & strut – Definition of column & Strut, types, effective length for different end conditions, slenderness ratio, Buckling load.

Torsion – Equation, torsional rigidity & power transmission for solid & hollow shafts.

## 5. Hydraulics

08

Fundamentals – properties of fluids, total pressure, centre of pressure for circular, rectangular & triangular vertical plates.

Flow of fluids – Types of flow, Bernoulli’s equation, continuity equation.

Flow through orifice – Types of orifice, Vena contracta, Hydraulic co-efficients & their relationships.

Flow through Notches- discharge over rectangle & triangular notches.

Flow over weir – Types of weir, discharge over rectangular weir, end contraction.

Flow through canals – Types, Chezy’s & manning’s formula, Most economical section.

Flow through pipes – Types of Major & minor losses, water hammer, surge tanks.

Pumps & Turbines- centrifugal & reciprocating pumps, Pelton & Francis turbines.

## 6. Water Resources Engineering

08

Hydrology – Hydrological cycle, rainfall, runoff, computation of average rainfall.

Irrigation – Base period, Crop period, Duty, Delta & Relationship, types of irrigation, methods of irrigation.

Reservoirs & Dams – site selection, gravity & earthen dams, spillways, gates.

Distribution & cross drainage works- Types of canals, Canal alignment, canal lining, aqueduct, super passage, sluices.

Diversion & river training works- Weirs, barrages, canal head regulator, marginal bunds, guide banks.

Ground water – Types of Aquifers, porosity, ground water yield, specific yield, specific retention, permeability, transmissibility.

## 7. Structural Engineering

12

Concrete Technology - Ingredients of concrete, Admixture, W/C ratio, Grade of concrete & steel, Design mix concepts, Curing, Special concrete, High strength concrete & steel for Pre stressing, Post tensioning, Pre tensioning.

RCC Limit state – Limit state of collapse, limit state of serviceability, Characteristic strength of materials, partial safety factors, stress block, Neutral axis, Moment of resistance.

Analysis and design requirements for – Singly reinforced, doubly reinforced sections for

flexure and shear, lintels, T-Beam, one way slab, Two way slab, sun shade and cantilever slab, short column for axial load, square footing, dog legged stair case spanning longitudinally.

Steel structures-Analysis and design requirements for – Bolted & welded joint, main & secondary beams, effective length & slenderness ratio for column , slab base & gusseted base plate, strut, end conditions, tie member.

Design of Masonry - Earth pressure without surcharge, Angle of repose, Rankine’s method, stability conditions, water pressure, pressure distribution at foundation.

**8. Environmental Engineering 07**

Water supply – sources of water, water requirements, per capita demand, impurities, tests, purification of water, distribution system, appurtenance, water conservation.

Sanitary Engineering- definition of sewage, sewer, garbage, sullage, types of sewerage system, quantity of sewage, sewer appurtenance, sewage treatment & disposal, house drainage system, collection & disposal of solid waste.

Pollution – Causes, effects & control of Air, water & Noise Pollution.

**9. Transportation Engineering 12**

Roads – Importance of transportation, classification of roads, geometrics, types of pavements, road drainage, traffic engineering.

Bridges – Elements of bridges, types of bridges.

Air ports – Components of Airports, Location & orientation.

Railways- Permanent way, rails, sleepers, ballast, points & crossings, station & yards.

Tunnels- Size & shape of tunnels, construction of tunnels, drainage in tunnels.

Harbours – Types, Break water, jetties, quays, signals.

**10. Construction management 04**

Construction Team, Construction stages, CPM, PERT, Organisation in PWD, Contract, Types of Contract, Tender, EMD, SMD, measurement book, Indents, Bin cards, payment of bills, Safety in construction, Entrepreneurship & management.

**11. Estimation & costing 04**

Units of measurements, types of estimate, specification, analysis of rates, schedule of rates, valuation, rent fixation, depreciation, scrape value, market value, book value, earth work quantities.

**12. Civil Engineering Drawing 03**

Scales, dimensioning, Geometric constructions, projection, orthographic views, isometric views & Perspective views.

Building Drawing requirements-byelaws, setbacks, FAR, site plan, layout plan, Building planning.

Irrigation & bridge drawing requirements-side slope, berms, hearting materials, batters, grip trenches, head wall, gibet wall, thumb rules, revetment, cutoff wall, ease & cut water.