ANNEXURE - I

CIVIL ENGINEERING

STRENGTH OF MATERIALS

UNIT:1
Simple stresses and strains-curves for ductile materials-Mechanical properties of materials-Hooke's law-lateral strain-Poisson's ratio-Elastic constants and the relation between them-Composite sections- Resilience-Strain energy-Gradual and sudden loading-Shear force and Bending Moment Diagrams for cantilever, simply supported, fixed, continuous and overhanging beams subjected to Point loads and UDL

UNIT:2
Theory of simple bending-assumptions-bending equation-bending stresses-Section Modulus-Shear stress distribution across various sections like rectangular, circular and I-sections.

THEORY OF STRUCTURES:

UNIT:3
Deflection of cantilevers and simply supported beams-Double Integration and Macaulay's methods-Mohr's theorems for slope and deflections-calculation for propped cantilevers subjected to simple loading-Analysis of Fixed and Continuous beams of uniform section for simple loading without sinking of supports. Columns and struts-types-slenderness ratio-Euler's and Rankine's formulae for axial loading. Determination of forces in members of statically determinate, plane and pin-jointed trusses for dead loads only. Dams and retaining walls-conditions for stability-middle third rule-Rankine's formula for active earth pressure.

REINFORCED CONCRETE STRUCTURES:
UNIT:4
Grades of concrete, characteristic strength, Modulus of Elasticity-I.S. 456 -2000-Philosophy of Limit state design. Limit state of Strength and Service ability, partial safety factor-design strength of materials and design loads-assumptions.
Analysis and Limit state design of rectangular beams-Singly, Doubly reinforced and T-beams. Shear in RCC beams, lintels and sunshades-Development length.
Slabs-analysis and limit state design of one-way and two-way slabs as per IS.456-2000.Torsion reinforcement. Design of continuous slabs and beams-Deflection check for Slabs and beams. Detailing of reinforcement in Singly reinforced and doubly reinforced simply supported beams of rectangular sections and lintels, one way and two way slabs.

UNIT:5

Columns: Codal provisions of I.S 456-2000-short and long columns-different shapes-design of short columns by limit state method-long columns- concept, effective lengthfor different end conditions. Footings-Isolated column footings-one way shear and two-way shear. Stairs-types, loads on stairs.

Working stress method of design: Basic principles, neutral axis, lever arm-Design and analysis of Singly reinforced simply supported rectangular beams. Comparison of Limit stateandWorking stress methods.

SURVEYING:

UNIT:6

Chain surveying- purpose and principle- errors and corrections- different operations in chain surveying- obstacles – methods of calculation of area. Compass Surveying- purpose and principle-bearings-traversing using prismatic compass-local attraction-errors. Levelling-definitions-component parts-errors-classification of levelling-contouring-characteristics and methods. Theodolite- principles and component parts- fundamental lines and relationship among them- adjustments of theodolite- measurement of horizontal and vertical angles-errors-traverse computations- bowditch and transit rule. Tacheometry-principle-stadiatacheometry-tangential tacheometry, Total Station, Global positioning System – Importance, G.I.S – Use and applications in Civil Engineering

HYDRAULICS.

UNIT:7

Fluid properties-specific weight–mass density-specific gravity-surfacetension-capillarity-viscosity. Atmospheric pressure, gauge pressure and absolute pressure. Fluid pressure on plane surfaces-Centre of pressure, measurement of fluid pressure using Piezometer and mano meters. Types of flows-uniform, nonuniform, steady, unsteady, laminar and turbulent flows. Energies of liquid in motion-continuity equation. Bernoulli's theorem-Pitot tube-Venturi meter. Flow thorough small and large orifices, free orifices, submerged orifices, co-efficients of orifices-Cc, Cv and Cd. Flow through internal, external, convergent and divergent mouthpieces. Types of Notches-rectangular and triangular, flowover notches. Types of Weirs-sharp crested and broad crested-mathematical formulae for discharge-Francis and Bazin's.

UNIT:8

Flow through pipes-major and minor losses-Chezy's and Darcy's formulae for loss of head due to friction-HGL & TEL- Reynold's number forlaminar and turbulent flows. Flow through open channels-rectangular and trapezoidal-chezy's formula for discharge -Kutter's and Manning's equation for Chezy's constants-Most economical sections. Centrifugal pumps without problems. Classification of Turbines- Kaplan, Franci's and Pelton wheel without problems-use of Draft tube. Hydro-electricalinstallations-componentsand uses.
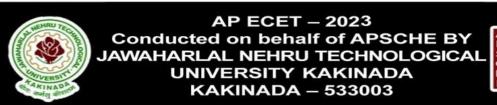
IRRIGATION ENGINEERING:

UNIT:9

Necessity of Irrigations- Perennial and inundation Irrigation, Flow and Lift Irrigation, Principal crops-kharif and rabi seasons-Duty, delta and base period. Methods of Irrigation-check flooding, basin flooding, contour bunding, furrow, sprinkler and drip Irrigations. Hydrology – Rainfall, types of Rain gauges, types of catchments-rain fall and run off. Measurement of velocity of flow in streams-Ryve's and Dicken's formulae for computing maximum flood discharge. Classifications of Head works-component parts of diversion head works. Weirs and Barrages. Percolation and uplift pressures. Types of Reservoirs-dead storage, live storage and surcharge storage.

UNIT: 10

Storage Head works-different types of dams-rigid and non-rigid dams- gravity dams-low and high dams. Elementary profile of a dam. Failures of gravity dams-drainage galleries. Ogee and siphon spill ways. Earth dams— types, failures and precautions. Phreatic lines and drainage arrangements in earthen dams. Distribution works-classifications and alignment of canals-typical cross section of a canal-berm and balanced depth of cutting- canal lining. Lacey's silt theory. Cross drainage works–types and functions.

ANNEXURE - II

Number of Questions to be set

CIVIL ENGINEERING

UNIT NO	TOPICS	MARKS
I & II	Strength of Materials	20
III	Theory of Structures	20
IV & V	Reinforced Concrete Structures	20
VI	Surveying	15
VII & VIII	Hydraulics	15
IX & X	Irrigation Engineering	10
	Total	100

ANNEXURE - III
MODEL QUESTIONS FOR CIVIL ENGINEERING

1. The Maximum Bending moment for a simply supported beam with uniformly distributed load, 'ω' and a span of 'l' is

   1) $\frac{wl}{2}$

   2) $\frac{wl^2}{8}$

   3) $\frac{wl^2}{2}$

   4) $\frac{WL^2}{4}$

2. As per IS 456-2000, the least lateral dimension of a short column with effective length, l is

   1) $> \frac{l}{12}$

   2) $= \frac{l}{12}$

   3) $< \frac{l}{12}$

   4) $\geq \frac{l}{10}$

3. The Reduced bearing with W.C.B $=120^0$ is

   1) $N30^0E$

   2) $S\ 60^0E$

   3) $N30^0W$

   4) $S\ 30^0W$

4. The relation between c_d, c_v, c_c for orifices is

   1) $c_d = \frac{cc}{cv}$

   2) $c_c = c_v \times c_d$

   3) $c_d = c_c \times c_v$

   4) $c_v = c_c \times c_d$