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-Torsion-solid and hollow circular shafts.

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 Serviceability, 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 length for 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 state and Working 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- stadia tacheometry- tangential tacheometry, Principle and uses of E.D.M, Electronic Theodolite, 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-surface tension-capillarity-viscosity. Atmospheric pressure, gauge pressure and absolute pressure. Fluid pressure on plane surfaces-Centre of pressure, measurement of fluid pressure using

piezometer and manometers. Types of flows-uniform, non uniform, steady, un steady, laminar and turbulent flows. Energies of liquid in motion-continuity equation. Bernoulli's theorem-Pitot tube-Venturimeter. 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, flow over notches. Types of Weirs-sharp crested and broad crested-mathematical formulae for discharge-Franci's 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- flow through siphon pipes. Reynold's number for laminar 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-electrical installations-components and uses.

IRRIGATION ENGINEERING:

UNIT:9 Necessity of Irrigations - Perinnial 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-rainfall and runoff. 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. Perculation 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 spillways. 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. What is the Bending moment equation for a simply supported beam with uniformly distributed load, 'ω' with a span of 'l'

   1) $\frac{wl}{2}$ 2) $\frac{wl^2}{8}$ 3) $\frac{wl^2}{2}$ 4) $\frac{WL^2}{4}$

2. What is a long column with load w and effective length l with span to effective depth ratio

   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

   1) N 30^0 E 2) S 60^0 E 3) N 30^0 W 4) S 30^0 W

4. What is the relation between c_d, c_v, c_c with orifices

   1) $c_d = \frac{cc}{c\,v}$ 2) $c_c = c_v \text{ X } c_d$ 3) $c_d = c_c \text{ X } c_v$ 4) $c_v = c_c \text{ X } c_d$