

## Syllabus for PG Entrance Test

### ENGINEERING MECHANICS :

**Static of force systems :** Composition and resolution of forces, concurrent, non-concurrent and parallel forces in a plane, Lami's theorem, Moment of a force and Varignon's theorem, conditions of equilibrium, polygon of forces, couple, moment of a couple, Types support and calculation of support reaction Truss, analysis of forces in trusses, method of joints, method of sections, graphical method for perfect trusses.

**Centroid & Moment of Inertia :** Location of centroid and Moment of Inertia of plane areas, Radius of gyration Perpendicular Axis and Parallel Axis theorems, Product of Inertia, Principal Axes and Principal Moment of solid bodies, Mohr's circle for principle moment of inertia..

**Friction :** Basics of friction ,Types of friction, Coloumb's law of friction , Friction on horizontal and inclined plane. Cone of friction Screw and Nut friction, Ladder and wedge friction.

**Shear Force and Bending Moment:** Shear force and bending moment, Relationship between shear force and bending moment for pure bending, Shear Force and Bending moment Diagram for Cantilever and Simply supported beam with concentrated, distributed load, and couple. Overhanging beams. Point of Contra-flexure.

### STRENGTH OF MATERIALS :

**Simple Stress and Strains :** Stress and strain. Hooke's law, various types of stress and strains. Elastic constants. Stresses in compound bars, composite and tapering bars, Temperature stresses.

**Complex Stress and Strains :** Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal planes, Principal Stresses and strains, Mohr's circle of stresses, Combined Bending and Torsion, Theories of failure.

**Theory of Simple Bending:** Concept of pure bending and bending stress, Equation of bending. Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, cantilever and overhanging beams subjected to point load and uniformly distributed loading. Bending & shear stress distribution across a section in beams.

**Deflection of beams:** Double Integration method, Macaulay method, Area Moment method, Conjugate Beam method and Strain Energy method.,

**Columns and Struts:** Euler's buckling load for uniform section, various end conditions. Slenderness ratio. Stress in columns. Rankine formulae, Eccentric loading on columns.

**Combined Direct & Bending Stress:** Introduction and middle third rule.

**Torsion of Shafts :** Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow shafts, Open and closed coil springs, Leaf spring. Spiral spring.

**Pressure Vessels :** Thin and Thick walled cylinders and spheres, Stress due to internal pressure, Change in diameter and volume. Compound cylinders and shrink fittings.

### ANALYSIS OF STRUCTURES :

**Virtual work and Energy Principles :** Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed, determinate indeterminate for static loads using costing lianas theorem.

**Indeterminate Structures-I&II :** Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by theorem of three moments, Effect of sinking and rotation of supports. Analysis of beam and frames (rigid and non rigid) by consistence deformation method. Analysis of beams & frames by slope Deflection method and Column Analogy method.

**Arches and Suspension Cables:** Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and temperature effects.

**Rolling loads and Influence Lines:** Maximum SF and BM curves for various types of Rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams.

**Moment distribution methods** in analysis of frames with and without sway and analysis of beams. Analysis of box frames, analysis of portals with inclined members.

**Theory of Plasticity :** Plastic analysis of simply supported, Cantilever, fixed and continuous beam and frames.

**Unsymmetrical bending:** Principal moment of inertia, product of inertia, bending of a beam in a plane which is not a plane of symmetry, shear centre.

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concept, Analysis of beams, Truss and frames by force and displacement method.

**Influence lines** for intermediate structures, Muller Breslau principle, Analysis of Beam-frames. Introduction to space truss by tension coefficient method.

**Kani's method & Curved Beams:** Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis, Analysis of beam and frames by Kani's method.

**Analysis for multi storey structure :** lateral load - Portal cantilever and factor method and substitute frame method for approximate analysis.

#### CONCRETE TECHNOLOGY :

**Concrete Technology:** Introduction Classification, properties, grades, advantage and disadvantages of concrete, ingredients of concrete, types of cement, Sand, aggregates, water and admixtures.

**Testing of Concrete:** Inspection, testing and quality control of constituent materials of concrete as per Indian Standard Specification. **Admixtures:** various types, their role in concrete. **Type of concrete:** Light weight concrete, Ferro cement, fiber reinforced concrete, polymer concrete composites. Properties & uses.

**Properties of Fresh and Hardened Concrete:** Introduction, Workability, Testing of concrete, factors affecting concrete, Rheology of concrete, Compressive and Tensile strength, Stress and strain characteristics, shrinkage and temperature effects. Creep of concrete permeability, durability, thermal properties and micro cracking of concrete.

**Design of Concrete Mix:** Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Pozzolanic materials.

#### DESIGN OF R.C.C. STRUCTURES :

**Basic Principles of Structural Design :** Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Partial load factors and analysis of singly and study of IS-456, IS-875 and SP-16 reinforced beam section by both methods.

**Design of Beams:** Analysis Singly and Doubly reinforced sections, Design of rectangular, flanged beams. Design of Lintels, Cantilever, simply supported and continuous beams, Design of beam for shear, bond and torsion.

**Design of Slabs:** Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions with different end conditions.

**Columns:** Effective length of columns, Short and long columns, Square, Rectangular and Circular columns. Design of columns subjected to axial loads and uniaxial and biaxial bending moment with the help of SP-16.

**Footings & Staircases:** Isolated footings, rectangle & circular footing. Design of different types of staircases. Design of Combined footing, deep foundation, raft footing.

**Earth Retaining Structures :** Cantilever and counter fort types retaining walls.

**Water Tanks :** Tanks on ground and underground tanks: square, rectangular, circular tanks, Overhead tanks: square, rectangular, Circular & intze tanks.

**Silos and Bunkers.**

**Prestress** Introduction, Analysis and losses.

**Bridge Engineering :** Culvert and T Beam bridge.

#### DESIGN OF STEEL STRUCTURES :

Study of IS-800 1984 & 2007 by design of structural connections – Bolted, Riveted and Welded connections both design methods. Design of compression members, tension members, Roof Trusses – Angular & Tubular, Lattice Girders. Design of simple beams, Built-up beams, Plate girders. Effective length of columns, Design of columns – simple and compound, lacings and battens. Design of footings for steel structures, grillage foundation.

**Chimneys :** Guyed and self supporting steel stacks. **Bunkers, Silos, Water Tanks :** Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

**Design of industrial multiplex** – multi storey frames, bracings, gantry girder. Design of Tubular structure

**Design of Bridge :** Plate girder and truss girder bridges.

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