2.15 30281 STRUCTURAL MACHINES

UNIT-1.
Properties of Materials Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials. Tensile test, compressive test, impact test, fatigue test, torsion test.

UNIT-2.
Simple Stresses and Strains Concept of stress, normal and shear stresses due to torsion Concept of strain, strain and deformation, longitudinal and lateral strain, poison's ratio, Volumetric strain Hooke's law, module of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants. Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produces in compound bars (two or three) due to axial load. Stress-strain diagram for mild steel, mechanical properties, factor of safety Temperature stresses and strains

UNIT-3.
Bending Moment and Shear Force Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, fixed and continuous beams Types of loads (point, uniformly distributed and varying loads) Concept of bending moment and shear force, sign conventions Bending Moment and shear force diagrams for cantilever, simply supported and over hanging beams subjected to concentrated, uniformly distributed and uniformly varying loads (B.M. and S.F. diagrams should preferably be drawn on graph paper. Relationship between load, shear force and bending moment, point of maximum bending moment and contra flexure.

UNIT-4.
Second Moment of Area Concept of second moment of area, radius of gyration Theorems of parallel and perpendicular axes Second moment of area for sections of Rectangle, Triangle, Circle, Trapezium, Angle, Tee, I, Channel and Compound sections. (No derivation)

UNIT-5.
Bending and Shear Stresses Theory of simple bending Application of the equation M / I= sigma / Y= E/R (No derivation is required) Moment of resistance, sectional modulus and permissible bending stresses in circular, rectangular, I, T and L sections; Comparison of strengths of the above sections.

UNIT-6.
Slope and Deflection Necessity for determination of reflection Moment area theorems (no derivation) Computation of slopes and deflections using moment area theorems for: (a) Simple supported beam with UDL over entire span and concentrated load at any point (c) Cantilever with UDL over entire span and concentrated load at free end

UNIT-7.
Columns Theory of columns, Euler, Rankine's and I.S. formulae.

UNIT-8.

Combined Direct and Bending Stresses Concentric and eccentric loads, eccentricity Effect of eccentric load on the section, stresses due to eccentric loads, and examples in the case of short columns. Effect of wind pressure on walls and chimneys; water pressure on dams and earth pressure on retaining walls their causes of failures and their stability.

UNIT-9.

Analysis of Trusses Concept of a frame, redundant and deficient frame, End supports, ideal and practical trusses. Analysis of trusses by: (i) Methods of joints (ii) Method of sections and (iii) Graphical method

Reference Book:

1. Structural Mechanics by A.K.Upadhayay