

## 2.1 30251 STRENGTH OF MATERIALS

### UNIT-1 STRESSES AND STRAINS

- 1.1 Load
- 1.2 Effect of a load on a member
- 1.3 Stress
- 1.4 Strains
- 1.5 Volumetric strain
- 1.6 Poisson's ratio
- 1.7 Elasticity and elastic limit
- 1.8 Hook's law
- 1.9 Modulus
- 1.10 Stress and strain in simple and compound bar
- 1.11 Principle of super position
- 1.12 Temperature stress and strain
- 1.13 Relation between E, G and K

### UNIT-2 THIN PRESSURE VESSEL

- 2.1 Introduction
- 2.2 Assumption for determining stresses in thin pressure vessel
- 2.3 stresses in thin pressure vessel
- 2.4 Volumetric strain in pressure vessel
- 2.5 modification for built up pressure vessels

### UNIT-3 RESILIENCE AND INSTANTANEOUS STRESS

- 3.1 Mechanical properties
- 3.2 Behavior of a ductile material
- 3.3 Stress-strain diagrams
- 3.4 ultimate stress working stress and factor of safety
- 3.5 Elastic and plastic zone
- 3.6 Strain hardening or work hardening
- 3.7 Percentage elongation and reduction in area
- 3.8 Homogeneous and isotropic material
- 3.9 proof stress
- 3.10 types of loading

### UNIT-4 MOMENT OF INERTIA

- 4.1 Introduction
- 4.2 Moment of inertia (M.O.I)
- 4.3 Parallel axis theorem
- 4.4 Perpendicular axis theorem
- 4.5 Moment of inertia of different bodies
- 4.6 Section modulus

## **UNIT-5 BENDING STRESSES**

- 5.1 Definitions
- 5.2 Assumptions for theory of simple bending
- 5.3 Theory of simple bending or bending equation
- 5.4 Comparison between moment of resistance and flexural strength of different section of beam
- 5.5 Section modulus for different shapes of beam sections

## **UNIT-6 TORSION**

- 6.1 Introduction
- 6.2 Assumption for torsion equation
- 6.3 Torsion equation for solid shaft
- 6.4 Torsion equation for hollow circular shaft
- 6.5 Comparison between hollow and solid shafts
- 6.6 Power transmitted
- 6.7 Stiffness of a shaft
- 6.8 Concept of mean and maximum torque
- 6.9 When shaft in series
- 6.10 When shaft in parallel

## **UNIT-7 SPRING**

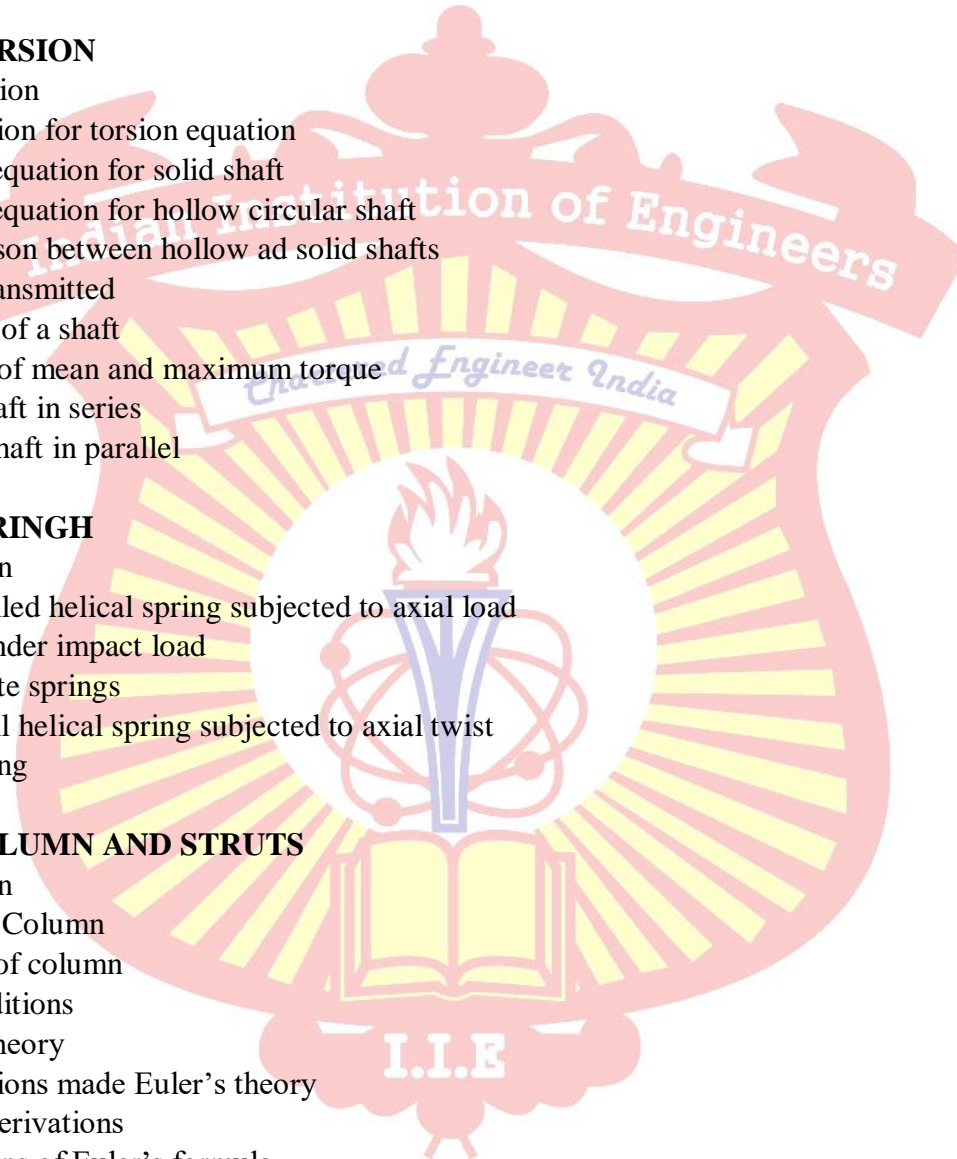
- 7.1 Definition
- 7.2 Close coiled helical spring subjected to axial load
- 7.3 Spring under impact load
- 7.4 Composite springs
- 7.5 Close coil helical spring subjected to axial twist
- 7.6 Leaf spring

## **UNIT-8 COLUMN AND STRUTS**

- 8.1 Definition
- 8.2 Types of Column
- 8.3 strength of column
- 8.4 End conditions
- 8.5 Euler's theory
- 8.6 Assumptions made Euler's theory
- 8.7 Euler's derivations
- 8.8 Limitations of Euler's formula
- 8.9 Rankine formula

## **UNIT-9 SHEAR FORCE AND BENDING MOMENT DIAGRAMS**

- 9.1 Beam
- 9.2 Classification of beams
- 9.3 Types of support



- 9.4 Types of loading
- 9.5 Shear force
- 9.6 Bending Moment
- 9.7 Sign convention for SFD and BMD
- 9.8 Relation between load intensity, shear force and bending moment
- 9.9 Steps followed to draw SFD and BMD for beams other than cantilever beam
- 9.10 Methods to draw SFD and BMD for cantilever beam
- 9.11 Cantilever beam carrying a concentrated load at free end
- 9.12 Cantilever carrying a UDL over its entire span
- 9.13 Points of contra flexures
- 9.14 Simply supported beam carrying a point load
- 9.15 Simply supported beam carrying a UDL
- 9.16 Overhang beam carries point load on both ends (Both side overhang)
- 9.17 Overhanging beam carries a UDL over whole span (Over hanging from both sides)

#### **UNIT-10 DIRECT AND BENDING STRESSES**

- 10.1 Introduction
- 10.2 Direct and bending stresses
- 10.3 Eccentric loading about one axis
- 10.4 Eccentric loading about two axis
- 10.5 Middle third rule

#### **UNIT-11 SLOPE AND DEFLECTION**

- 11.1 Introduction
- 11.2 methods as determining slope and deflection at any section in a loaded beam
- 11.3 Simply Supported beam carrying a point at the center
- 11.4 simply supported Beam with an eccentric point load
- 11.5 Simply supported beam carries a U.D.L over whole length
- 11.6 Cantilever beam having point load at free end
- 11.7 Cantilever beam with a point load not at free end
- 11.8 Cantilever beam with U.D.L over entire length
- 11.9 Cantilever beam carrying a U.D.L from fixed end

**Reference Book:** Strength of materials by Tarun Gupta & Dharam Mangal