

ACADEMIC SESSION: WINTER-2023

Discipline :	Semester: 3rd	Name of the Teaching Faculty : Padma Lochan Behera, Sr. Lect. (Civil)
Subject: structural mechanics	No. of Days / Week class allotted: 5	Semester Duration: 01/08/2023 to 30/11/2023 No. of Weeks : 17
Week	Class day	Theory/Practical Topics:
1 st	1 st	Basic Principle of Mechanics: Force, Moment, support conditions
	2 nd	Conditions of equilibrium, C.G & MI , Free body diagram
	3 rd	Review of CG and MI of different sections
	4 th	Problems on CG & MI
	5 th	Problems on CG & MI
2 nd	1 st	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity
	2 nd	Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability
	3 rd	Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains
	4 th	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio
	5 th	Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc,
3 rd	1 st	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants
	2 nd	Problems
	3 rd	Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material
	4 th	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress
	5 th	Breaking stress, Percentage elongation, Percentage reduction in area,
4 th	1 st	Significance of percentage elongation and reduction in area of cross section
	2 nd	Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight
	3 rd	Principal stresses and strains: Occurrence of normal and tangential stresses,
	4 th	Concept of Principal stress and Principal Planes
	5 th	major and minor principal stresses and their orientations
5 th	1 st	Mohr's Circle and its application to solve problems of complex stresses
	2 nd	Problems
	3 rd	Stresses in beams due to bending: Bending stress in beams
	4 th	Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam
	5 th	Problems on simple bending
6 th	1 st	Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	2 nd	Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	3 rd	Stresses in shafts due to torsion: Concept of torsion, basic assumptions of pure torsion
	4 th	torsion of solid and hollow circular sections, polar moment of inertia,
	5 th	torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion


7 th	1 st	Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses
	2 nd	Maximum and Minimum stresses in Sections, Conditions for no tension,
	3 rd	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
	4 th	Columns and Struts: Definition, Short and Long columns
	5 th	End conditions, Equivalent length / Effective length, Slenderness ratio,
8 th	1 st	Axially loaded short and long column, Euler's theory of long columns,
	2 nd	Critical load for Columns with different end conditions
	3 rd	Problems to determine critical load
	4 th	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL)
	5 th	Types of Supports: Simple support, Roller support, Hinged support, Fixed support,
9 th	1 st	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction,
	2 nd	Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium
	3 rd	Shear Force and Bending Moment: Signs Convention for S.F. and B.M
	4 th	S.F and B.M of general cases of determinate beams with concentrated loads and udl only
	5 th	S.F and B.M diagrams for Cantilevers
10 th	1 st	Problems
	2 nd	Simply supported beams and Over hanging beams
	3 rd	Problems
	4 th	Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M
	5 th	Problems on S.F & B.M.
11 th	1 st	Slope and deflection Introduction: Shape and nature of elastic curve (deflection curve);
	2 nd	Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.
	3 rd	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).
	4 th	Problems
	5 th	problems
12 th	1 st	Class test
	2 nd	Indeterminacy in beams
	3 rd	Problems on indeterminacy
	4 th	Principle of consistent deformation/compatibility
	5 th	Analysis of propped cantilever and fixed beam
13 th	1 st	Durgapuja Holiday
	2 nd	
	3 rd	
	4 th	
	5 th	
14 th	1 st	problems
	2 nd	Analysis of two span continuous beams by principle of superposition,
	3 rd	problems
	4 th	SF and BM diagrams (point load and udl covering full span)
	5 th	problems

15 th	1 st	Trusses- Introduction: Types of trusses, statically determinate and indeterminate trusses
	2 nd	degree of indeterminacy
	3 rd	Problems on degree of indeterminacy
	4 th	stable and unstable trusses
	5 th	advantages of trusses.
16 th	1 st	Analysis of trusses: Analytical method : Method of joints
	2 nd	Problems on method of joint
	3 rd	Problems on method of joint
	4 th	Method of Section
	5 th	Problems on Method of section
17 th	1 st	Problems on Method of section
	2 nd	Revision Class
	3 rd	Revision Class
	4 th	Previous year question discussion
	5 th	Previous year question discussion

Prepared By :

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