STRENGTHOFMATERIALS-II(CE403PC) COURSE PLANNER

I. COURSE OVERVIEW: The aim of this course is to introduce basic principles of fluid mechanics and it is further extended to cove r the application of fluid mechanics by the inclusion of fluid machinery. Now a days the principles of flui d mechanics find wide applications in many situations. The course deals with the fluid machinery, like tu rbines, pumps in general and in power stations. This course also deals with the large variety of fluids suchas air,water, steam, etc;however the major emphasis is given for the studyofwater.

II. PREREQUISITE(S):

Level	Credits	Periods	Prerequisite
UG	3	4	StrengthofMaterials-I

III. COURSEOBJECTIVES: Attheendofthiscourse,astudentwillbeableto

1. DeterminestressesinthemembersubjectedtoTorsion
2. Analyzecolumnsandstruts
3. Understandtheconceptofdirectandbending stresses
4. Analyzeanddesignsprings, thinandthick cylinders
5. Understandthe conceptofunsymmetricalbending.

IV. COURSE OUTCOMES:

Aftercompletingthiscoursethestudentmustdemonstratetheknowledgeandabilityto:

S.NO	COURSE OUTCOMES(CO)	KnowledgeLevel (Blooms level)
CO1	Ableto understandthestressesdeveloped intheshaftssubjected totorque,bendingmomentandthrustandunderstandthedesign considerationstopreventthefailure.ii)Abletoapplythe formulae for the design of springs.	Knowledge, Understanding & apply(L1,L2, L3)
CO2	Understand the failure phenomenon of columns and struts and finding the stresses developed in them & Able to calculate the stresses induced in beam columns.	Knowledge, Understanding & apply(L1,L2,L3)
CO3	Able to apply the design principles for the design of dam, chimneys, retaining wallswhicharesubjectedto bothdirect and bendingstresses&Abletoapplythedesignprinciplesforthe designofbeamscurvedinplan.	Knowledge, Understanding & apply(L1,L2,L3)
CO4	Ableto calculate thestresses induced inthincylindersand thick cylinders and obtain safe dimensions.	UnderstandingL2
CO5	Able to calculate the stresses developed in a beam subjected to unsymmetrical bending and also find shear centre.	UnderstandingL2

V. HOWPROGRAMOUTCOMESAREASSESSED:

Programoutcomes		Level	Proficiency assessed by
PO1	Engineering knowledge: To Apply the knowledge of mathematics, science, engineering fundamentals/principals, and civil engineering to thesolutionofcomplexengineeringproblemsencounteredinmodern engineeringpractice.	3	Assignments
PO2	Problem analysis: Ability to Identify, formulate, review research literature, and analyze complex engineering problems related to Civil Engineering and reaching substantiated conclusions using first principles of mathematics, naturalsciences, and engineering sciences.	2.8	Exercise, Exams
PO3	Design/development of solutions: Design solutions for complex engineering problems related to Civil Engineering and design system componentsorprocessesthat meetthespecified needswithappropriate considerationforthepublichealthandsafety, andthecultural, societal, and environmentalconsiderations.	3	Exercise
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	-	-
PO5	Modern tool usage: Create, select, and applyappropriate techniques, resources, and modern engineering and ITtools including prediction and modelingtocomplexengineeringactivitieswithanunderstandingofthe limitations.	-	-
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and theconsequentresponsibilitiesrelevanttotheCivilEngineering professionalengineeringpractice.	1.75	Disssions
PO7	Environment and sustainability: Understand the impact of the Civil Engineering professional engineering solutions in societal and environmentalcontexts, and demonstratethe knowledge of, and need for sustainable development.		
PO8	Ethics:Applyethical principlesandcommittoprofessionalethicsand responsibilities and norms of the engineering practice.	-	----
PO9	Individualand teamwork: Functioneffectivelyas an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	2.25	MockTest
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with societyat large, such as,beingabletocomprehendandwriteeffectivereportsanddesign documentation, make effective presentations, and give and receive clear instructions.	-	------

PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	-----
PO12	Life-long learning: Recognize the need for, and have the preparationand ability to engage in independent and life-long learning in the broadest context of technological change.	2.25	Prototype, Discussions

VI. HOWPROGRAMSPECIFICOUTCOMESAREASSESSED:

Programoutcomes		Level	Proficiency assessed by
PSO1	**ENGINEERING KNOWLEDGE:** Graduates will be able to applytechnicalknowledge indrawing, analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure,alongwithgoodbasicsinmathematics,basic sciencesandtechnicalcommunication	2.50	Lecturesand Assignments
PSO2	**BROADNESS AND DIVERSITY:** Graduates will be able to summarize and can demonstrate about societal, economical, environmental, healthandsafetyfactorsinvolved ininfrastructural development,andshallworkwithinmultidisciplinaryteamswith competenceinmoderntoolusage.	2.50	Assignments & Seminars
PSO3	**SELF-LEARNING AND SERVICE:** Graduates will be able to pursue lifelong learning and professional development to face the challengingandemergingneedsofoursociety,ethicallyand responsibly.	2.50	--

VII. SYLLABUS:

JNTUHSYLLABUS

UNIT – I

Torsion ofCircularShafts: Theoryofpure torsion – DerivationofTorsionequations : T/J = q/r = Gθ/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design ofshafts according to theories of failure.

Springs: Introduction– Typesofsprings – deflectionofclose and opencoiled helicalsprings under axialpulland axial couple – springs in series and parallel – Carriage or leafsprings.

UNITII

Columnsand Struts: Introduction–Typesofcolumns–Short, mediumand longcolumns – Axiallyloadedcompressionmembers–Crushingload–Euler'stheoremforlongcolumns-assumptions-derivationofEuler'scriticalloadformulaeforvariousendconditions–

Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler'stheory– Rankine – Gordonformula – Long columnssubjectedto eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

BeamColumns: Laterallyloadedstruts–subjectedtouniformlydistributedand concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

UNIT–III:

DirectandBendingStresses: Stressesunderthecombinedactionofdirectloading and bending moment,coreofasection – determinationof stresses inthecaseof chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.

UNIT–IV

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal andcircumferentialstresses– hoop,longitudinaland volumetric strains – changes india, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick sphericalshells.

UNIT– V

Unsymmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred toany set of rectangularaxes– Stresses inbeams subjectedto unsymmetricalbending –Principalaxes–Resolutionof bending moment into two rectangular axes through the centroid – Location of neutral axis - Deflection of beams under unsymmetrical bending.

Shear Centre: Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, Tand L) sections

SUGGESTEDBOOKS:

TEXTBOOKS:

1. MechanicsofMaterials Ferdinand P. Beer et al., Tata McGraw HillEducationPvt.Ltd 5th edition 2009.
2. StrengthofMaterialsR.Subramanian,OxfordUniversityPress2010
3. StrengthofMaterials byB.S.Basavarajaiah,B.S.Mahadevappa, UniversityPress3rd Edition 2015.

REFERENCEBOOKS:

1. FundamentalsofSolidMechanicsbyM.L.Gambhir, PHILearningPvt.Ltd
2. IntroductiontoStrengthofMaterialsbyU.C.Jindal,GalgotiaPublicationsPvt.Ltd.
3. MechanicsofMaterialsbyR.C.Hibbeler,PearsonEducation

4. StrengthofMaterialsbyS.S.Rattan,TataMcGrawHillEducationPvt.Ltd.
5. StrengthofMaterialsbyR.KRajput,S.Chand&Company Ltd.
6. StrengthofMaterials byS.S Bhavikatti,VikasPublishingHousePvt.Ltd.

MOOC'S-SWAYAM/NPTEL:
https://nptel.ac.in/courses/105105108/

GATE SYLLABUS:
Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear centre; Uniformtorsion, buckling of column, combined and direct bending stresses.

IES SYLLABUS:
Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, PrincipalStresses, Bending, Shear and Torsion.

VIII. COURSEPLAN:

LectureNo.	UnitNo.	Topicstobecovered	LinkforPPT	LinkforPDF	Courselearningoutcomes	TeachingMethodology	Reference
1		Introductiontostrength of materials-2	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	An ability to identify,formulate, and solve engineering problems	Digital writing pad	
2	1	**TORSION OF CIRCULARSHAFTS**: Introduction	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Torsionequation, Polar moment if Inertia	Digital writing pad	**T1,T2,T3**
3		Assumptionsmadeinthe theory of pure torsion, Polar section modulus – Power transmitted by shafts, Theory of pure torsion – Derivation of Torsionequation-	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Bendingstressesand torsional stresses.	Digital writing pad	

4	Combinedbendingand torsion	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
5	Design of shafts accordingtotheoriesof failure.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Maximum stress theory,straintheory, vonmises theory	Digital writing pad
6	SPRINGS:Introduction– Types of springs	https://drive.google.com/drive/folders/1UoU9_N3xklYHvEebuzLBqXc07ySmbjoS	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**Tounderstand**: Stiffness of spring, combinedcompression and torsional shear stress analysis, deflection in springs arranged in parallel andseries	Digital writing pad
7	deflection of close and open coiled helical springsunderaxialpull and axial couple	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**Tounderstand**: Stiffness of spring, combinedcompression and torsional shear stress analysis, deflection in springs arrangedinparallel and series	Digital writing pad
8	springsinseriesand parallel.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand**:deflection in springs arranged in parallel and series	Digital writing pad
9	springsinseriesand parallel.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand**:deflection in springs arranged in parallel and series	Digital writing pad

10		**UNIT-2COLUMNS AND STRUTS**: Introduction–Typesof columns	https://drive.google.com/drive/folders/1UoU9_N3xklYHvEebuzLBqXc07ySmbjoS	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**Tounderstand:**Types of equilibrium conditions, neutral, stable, unstable.	Digital writing pad	
11		Axially loaded compressionmembers– Crushing load	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Euler'stheoremfor long columns, equivalentlengthof columns.	Digital writing pad	
12		Euler'stheoremforlong columns- assumptions- derivation of Euler's critical load formulaeforvariousend conditions	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Euler'stheoremfor long columns, equivalentlengthof columns.	Digital writing pad	
13							
14	**2**	Equivalentlengthofa column – slenderness ratio	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Euler'stheoremfor long columns, equivalentlengthof columns.	Digital writing pad	
15		Euler'scriticalstress– Limitations of Euler's theory–	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Euler'stheoremfor long columns, equivalentlengthof columns.	Digital writing pad	
16		Longcolumnssubjected to eccentric loading	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**Tounderstand:**To study Euler's, Rankine'sandother theoriesofcolumns	Digital writing pad	
17		Secantformula–	-	https://drive.g	Tounderstand:To	Digital	

		Empiricalformulae—Rankine	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	oogle.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	studyEuler's, Rankine'sandother theoriesofcolumns	writing pad	
18		Gordon formula-Straightlineformula–Prof. Perry's formula.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	To understand: To study Euler's, Rankine'sandother theoriesofcolumns	Digital writing pad	**T1,T2,T3**
19		**BEAM COLUMNS**: Introduction	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Transverseandlateral loading conditions	Digital writing pad	
20		Laterallyloadedstruts subjectedtouniformly distributed loads	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
21							
22		Laterally loaded struts subjectedtoconcentrated loads	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
23	**3**	**UNIT-3 DIRECT AND BENDINGSTRESSES**: Stresses under the combinedactionofdirect loading and bending moment	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**Tounderstand:** Stressesinbeam columns under concentratedand distributed load	Digital writing pad	
24		Stressesunderthe combined actionofdirect loadingandbending moment	- https://drive.google.com/drive/folders/13H10	https://drive.google.com/drive/folders/13H10SfisBpzZ		Digital writing pad	

			SfisBpzZy1JrqQPe4jVqKlSOFYHk	y1JrqQPe4jVqKlSOFYHk			
25		Determinationofstressesin retaining walls, chimneys and dams	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Stressesinrealtime conditionsondams, chimneys, walls	Digital writing pad	
26		Determinationofstressesin retaining walls, chimneys and dams	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
27		Determinationofstressesin retaining walls, chimneys and dams	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
28		Conditionsforstability-overturningandsliding Stresses due to direct loading Stressesduetobending moment about axis	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Stability for - overturning,direct bending	Digital writing pad	
29							
30	**3**	Conditionsforstability-overturningandsliding Stresses due to direct loading Stressesduetobending moment about axis	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Stability for - overturning,direct bending	Digital writing pad	**T1,T2,T3**
31		Conditionsforstability-overturningandsliding Stresses due to direct loading Stressesduetobending	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSO	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jV		Digital writing pad	

		momentabout axis	FYHk	qKlSOFYHk			
32		Conditionsforstability-overturning and sliding Stresses due to direct loading Stressesduetobending moment about axis	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
33		Conditionsforstability-overturning and sliding Stresses due to direct loading Stressesduetobending moment about axis	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
34							
35	**4**	**UNIT-4**Thinseamless cylindrical shells	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:**Concept of thin seamless cylindrical shells	Digital writing pad	
36		Thinseamlesscylindrical shells	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	
37		Derive the formula for longitudinal and circumferentialstresses, hoop, longitudinal and volumetric strains.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Understandthe formula	Digital writing pad	
38		Derive the formula for longitudinal and circumferentialstresses, hoop, longitudinal and volumetric strains.	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad	

39	AnalyzeLamestheoryfor thick cylinders	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Lames theory for thick cylinders, derivationoflames formulae	Digital writing pad
40	AnalyzeLamestheoryfor thick cylinders	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
41					
42	AnalyzeLamestheoryfor thick cylinders	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
43	Derive the derivation of lames formulae and distribution ofhoop and radial stresses across thickness,evaluatethick cylindersandcompound cylinders for necessary differenceofradiiunder shrinkage	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	**To understand:** Distribution of hoop and radial stresses across thickness, Design of thick cylinders,compound cylinders, necessary difference of radii for shrinkage, thick spherical shells.	Digital writing pad
44		https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
45		- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
46		https://drive.go	https://drive.g		Digital

			ogle.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	oogle.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		writing pad
47		Thinseamlesscylindrical shells	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Understand the concept of thin seamlesscylindrical shells	Digital writing pad
48		Thinseamlesscylindrical shells	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Understand the concept of thin seamlesscylindrical shells	Digital writing pad
49	**5**	**UNIT-5 UNSYMMETRICAL BENDING-** Introduction	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Differencebetween symmetrical and unsymmetrical bending	Digital writing pad
50		Centroidalprincipalaxes of section	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Differencebetween symmetrical and unsymmetrical bending	Digital writing pad
51		Momentofinertiatoany set of rectangular axes, stresses in beam subjected to unsymmetrical bending	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Moment of inertia about two principle axis and product momentofinertiato calculate bending stresses in different sections	Digital writing pad
52		Momentofinertiatoany setofrectangularaxes, stresses in beam	- https://drive.google.com/drive/	https://drive.google.com/drive/folders/13		Digital writing pad

		subjected to unsymmetricalbending	folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		
53		Momentofinertiatoany set of rectangular axes, stresses in beam subjected to unsymmetrical bending	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
54		Bendingmomentdueto applicationofloadwith some inclination	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	Centre where the section will bend instead of twisting forbothsymmetrical and unsymmetrical sections	Digital writing pad
55		Shear centre for symmetricalsection	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
56		Shear centre for unsymmetricalsection	- https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk	https://drive.google.com/drive/folders/13H10SfisBpzZy1JrqQPe4jVqKlSOFYHk		Digital writing pad
57						
58						

IX. MAPPINGCOURSEOUTCOMESLEADING TOTHEACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CO 'S	ProgramOutcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	2	-	-	2	2	-	2	3	2	2
CO2	3	2	3	-	-	2	-	-	2	3	-	3	2	3	3
CO3	3	3	3	-	-	2	-	-	3	2	-	2	2	2	3
CO4	3	3	3	-	-	2	-	-	2	2	-	2	3	3	2
CO5	3	3	3	-	-	1	-	-	2	2	-	2	2	2	2
AVG	3	2.8	3	-	-	1.75	-	-	2.25	2.25	-	2.25	2.50	2.50	2.50

N=None S=Supportive H=Highlyrelated

X. QUESTION BANK:
SHORTANSWERQUESTIONS-
UNIT-I

S.NO	Question	Blooms Taxonomy Level	Programme Out come
1.	Definepuretorsion	Understanding	1
2.	DefineTorsionalmomentofresistance	Understanding	1
3.	DefinePolarsectionmodulus	Understanding	1
4.	Defineshafts	Understanding	1
5.	DefineCombinedbending	Understanding	1
6.	Defineend thrust	Understanding	1
7.	Definesprings	Understanding	1
8.	Define leafsprings.	Understanding &remembering	1
9.	WhatarethelimitationsofEuler'stheory?	Understanding	1
10.	Whatisthe middlequarterrule forcircularsection?	Understanding	1

LONG ANSWER QUESTIONS-

S.No	Question	BloomsTaxonomy Level	Programme Out come
1.	Discussinbriefvariousprominent theoriesof failure.	Understanding&remembering	9
2.	ExplainPowertransmitted byshafts	Analyze	9
3.	Deriveequationfor deflectionofclose coiled helicalspringsunderaxialpull	Analyze	9
4.	Deriveequationfordeflectionofopencoiled helical springs under axial pull	Analyze&Apply	9
5.	Explainsprings inseries	Analyze&Apply	9
6.	Explainsprings inparallel	Analyze&Apply	9
7.	ExplainCarriageorleafsprings.	Analyze&Apply	9
8.	Derivetheexpressionforthemaximumbending stressdevelopedintheleafspring and also the centraldeflectionofaleafspring.	Analyze&Apply	9
9.	ExplainTypesofsprings	Analyze&Apply	9
10.	Deriveanexpressionforamembersubjectedto direct stress in one plane.	Analyze&Apply	9

UNIT-2

SHORTANSWERQUESTIONS-

S.N	Question	Blooms TaxonomyLevel	Programme Out come
1.	Defineshortcolumn	Understanding	9
2.	DefineStruts	Understanding	9
3.	DefineCrushingload	Understanding& remembering	9
4.	Definelongcolumns	Understanding& remembering	9
5.	Definevariousendconditions	Understanding& remembering	9
6.	Defineeccentricloading	Understanding& remembering	9
7.	Defineslendernessratio	Understanding& remembering	9
8.	ExplainEuler'scriticalload	Understanding	9
9.	Whatare Laterallyloadedstruts	Understanding	9
10.	Whatiseccentricloading	Understanding	9

LONG ANSWER QUESTIONS-

S.No	Question	Blooms TaxonomyLevel	Programme Out come
1.	ExplainEuler'stheoremfor longcolumns	Understanding	12
2.	ExplainEquivalentlengthofacolumn	Understanding	12
3.	ExplainStraightlineformula–Prof.Perry'sformula	Understanding	12
4.	ExplainLaterallyloadedstruts–subjectedto uniformlydistributedload	Analyze&Apply	12
5.	Explain Laterallyloadedstruts – subjected to concentratedload	Analyze&Apply	12
6.	Explainthe conceptofBeam-Columns	Analyze&Apply	12
7.	ExplainSecantformula	Analyze&Apply	12
8.	ExplainEuler'scriticalstress	Analyze&Apply	12
9.	ExplainRankine– Gordonformula	Analyze&Apply	12
10.	ExplainLimitationsofEuler'stheory	Analyze&Apply	12

UNIT-3
SHORTANSWERQUESTIONS-

S.No	Question	Blooms TaxonomyLevel	Programme Out come
1.	Definecircular beams	understanding	10
2.	Definestability	understanding	10
3.	Whatisthe middlequarterrule forcircularsection?	understanding	10
4.	Differentiatebetweensymmetricalandunsymmetrical bending	understanding	10
5.	Whatismomentofinertia?	Understanding	10
6.	Writethestresses indams?	understanding	10
7.	Whatisthedifferencebetweendamandaretaining wall?	Remembering	10
8.	Definechimney	Understanding& evaluate	10
9.	Whatarethestressesduetodirectloading?	Understanding& evaluate	10
10.	Writetheconditionforstabilityofdams.	Understanding& evaluate	10

LONGANSWER QUESTIONS-

S.No	Question	Blooms TaxonomyLevel	Programme Out come
1.	Explainconditionsforstability	Understanding	9
2.	Explaindeterminationofstresses inthecaseof chimney.	Analyze&Apply	9
3.	Explaindeterminationofstresses inthecaseof retaining wall.	Analyze&Apply	9
4.	Explaindeterminationofstressesinthecase ofdams.	Analyze&Apply	9
5.	Explainstressesduetodirectloading	Analyze&Apply	9
6.	Explainstressesduetobendingmomentaboutboth axis.	Analyze&Apply	9
7.	Whyisitnecessarytousetheminimumradiusof gyrationofsectiontocalculatethecrippling load? Explain briefly.	Analyze&Apply	9
8.	Explaintheconditionsforstabilityofdam.	Analyze&Apply	9
9.	Discussbrieflythestressesinbeams subjected to unsymmetricalbending.	Analyze&Apply	9
10.	Whatdoyoumeanbydirectstressandbendingstress?	Analyze&Apply	9

UNIT-4

SHORTANSWERQUESTIONS-

S.No	Question	Blooms TaxonomyLevel	Programme Out come
1.	DefineThinCylinders	understanding	l
2.	DefineThickCylinders	understanding	l
3.	Whatarehoopstresses	remembering	l
4.	Defineradialstresses	remembering	l
5.	Whatarecompoundcylinders	understanding	l
6.	WhatareThinsphericalshells.	remembering	l
7.	Defineradiiforshrinkage	understanding	l
8.	DefineThicksphericalshells.	Understanding& remembering	l
9.	WriteLame's formulae	Understanding& remembering	l
10.	What areVolumetricstrains	Understanding	l

LONG ANSWER QUESTIONS-

S.No	Question	Blooms TaxonomyLevel	Programme Out come
1.	ExplainLame'stheoryforthickcylinders	Analyze&Apply	10
2.	Explaindesignofthickcylinders	Analyze&Apply	10
3.	Explaindesignofcompoundcylinders	Analyze&Apply	10
4.	Defineandexplainmaximumstrainenergytheory.	Analyze&Apply	10

5.	Ahollowrectangularcolumnishavingexternaland internal dimensionsas 140cm deep x 100 cm wide and 100 cm deep x 60cm wide respectively. A vertical load of 220kN is transmitted in the vertical plane bisecting 140 cmsideat aneccentricityof10cm from the geometric axis of the section. Calculate the maximum and minimum stresses in the section.	Analyze&Apply	10
6.	Determine the stresses and deflection at the midpoint ofachannelsectionby unsymmetrical method.Alsoidentifythepositionoftheneutralaxis.	Understanding	10
7.	Explain briefly how stresses inbeams due to un symmetricbendingis considered.b)Explainbriefly themethodoflocatingshearcentre.	Understanding	10
8.	The external diameters of a steel collar are 200mm, andthe internaldiameter decreases by0.125mmwhen shrunk on to a solid steel shaft of 125mmdiameter. Findthereductionindiameterofthe shaft, theradial pressure between the collar and the shaft and hoop stress at the inner surface of the tube. Take E = 210GN/m^2 and 1/m=0.3.	Evaluate	10
9.	Acolumnisrectangularincrosssection300x400 mmThe column carries an eccentric loading of 360kN ononediagonalatadistanceofquarterdiagonallength froma corner. Calculate the stresses at all four corners.Alsodraw stress distribution diagram forany side.	Evaluate	10
10.	Writethedifferencesbetweenhoopandradial stresses.	Understanding	10

UNIT-5

SHORTANSWERQUESTIONS-

S.No	Question	BloomsTaxonomy Level	Programme Out come
1.	DefineCentroidalprincipalaxis.	Understanding	6
2.	DefineMomentsofinertia	Remembering	6
3.	WhatisUnsymmetricalBending	Remembering& Understanding	6
4.	DefineShearcentre	Remembering& Understanding	6
5.	WhatarePrincipalaxes	Understanding	6
6.	Defineneutralaxis	Understanding	6

7.	Whatismomentofinertia?	Understanding&remembering	6
8.	WriteanoteonMohr'scircle ofstresses.	Understanding	6
9.	DefineMohr’scircle	Remembering& Understanding	6
10.	Differencesbetweenmajorandminorprincipalaxis	Understanding	6

LONG ANSWER QUESTIONS-

S.No	Question	BloomsTaxonomy Level	Programme Out come
1.	Derivethenormalstress,tangentialstressand resultantstressoftwomutuallyperpendicular principal stresses of unequal intensities by Mohr’s method.	Analyze&Apply	10
2.	Defineandexplainmaximumstrainenergytheory.	Analyze&Apply	10
3.	Acolumnisrectangularincrosssection300x400 mm .The column carries an eccentric loading of 360kN on one diagonal at a distance of quarter diagonallengthfromacorner.Calculatethestressesat allfourcorners.Also drawstressdistributiondiagram for any side.	Analyze&Apply	10
4.	Atapointinamaterial,thestressesontwo mutuallyperpendicularplanesare 50N/m^2 m (tensile)and30N/mm^2 tensile).Theshear stress acrosstheseplanesis12N/mm^2. Using Mohr circle, find agnitude and direction ofthe resultant stresson a plane making anangleof35 degreeswiththeplaneof the first stress. Find also, the normal and tangential stresses on this plane	Analyze&Apply	10
5.	Determinethestressesanddeflectionatthe midpointofachannelsectionbyunsymmetricalmethod.Al soidentifythepositionoftheneutralaxis.	Apply	10
6.	Explainbrieflythemethodoflocatingshear centre.	Analyze&	10
7.	Explainbrieflyhowstressesinbeamsduetoun symmetricbending isconsidered	Analyze&Apply	10
8.	ExplainShear centreforsymmetricalsections (channel,I,TandL)	Analyze&Apply	10
9.	ExplainShear centreforunsymmetricalsections (channel,I,TandL)	Analyze&Apply	10
10.	Explain1Deflectionofbeamsunderunsymmetrical bending.	Analyze&Apply	10

XI. OBJECTIVEQUESTIONS:JNTUH

UNIT-1

1) Shearstress energytheoryis called as _____
   a.distortiontheoryb.VonMises theoryc.botha.andb.d.noneoftheabove
2) Fordesigningductilematerials, whichofthefollowingtheories is/areused?
   a. Maximumshear stresstheory b.Shear strainenergytheory
   c.Botha.and b. d.Noneoftheabove
3) A circular bar is subjected to an axial force and shear force, the difference between two principlestresses is120Mpa. Basedonmaximum shear stresstheorywhat isthe factorof safety, if elastic limit ofthe bar is 300 Mpa**?**
   a..5b.2c.2.5d.3
4) Principal stress of 30 Mpa and -70 Mpa acts on a material which has elastic limit stress in simpletensionandcompressionas60Mpaand200Mparespectively. Specifythereasonfor failure of the material assuming maximum principle stress theory.
   a. Compressionb.Tensionc.Unpredictable
5) Accordingto maximumstrainenergytheory, failureofmaterialdueto complexstresses occurs when total stored energy per unit volume at a point _____
   a. reachesthevalueofyieldpoint
   b. reachesthevalueofstrainenergystoredperunitvolumeatyieldpoint
   c. reachesthevalueofstrainenergystoredperunitvolumeatelasticlimit
   d. exceedstotalstrainenergycausedbyuniaxialstressatelasticpoint
6) Minorprincipalstresshas minimum_____
   a. valueofshear stressacting ontheplane b.intensityofdirectstress
   c.botha.and b. d.noneoftheabove
7) The anglebetween normalstress and tangentialstress is knownas angle of_____
   a.declinationb.orientationc.obliquityd.rotation
8) Themaximumtangentialstress$\sigma_t=(\sigma_x \sin 2\theta)/2$ismaximumif, θisequalto_____
   a.45^{o}b.90^{o}c.270^{o}d.alloftheabove
9) Whatisthe valueofshear stressactingonaplane ofcircular bar which issubjectedto axial tensile load of100 kN?(Diameter ofbar = 40 mm , $\theta = 42.3^o$
   a.58.73Mpa b.40.23Mpa c.39.60Mpa d.insufficientdata
10) Stressinthe cross sectionofashaftatthe centre_____
    a. iszero b.decreaseslinearlytothemaximumvalueofatoutersurface
    c.botha.and b. d.noneoftheabove

UNIT-2

1) WhatisthevalueofRankine'sconstantforcastiron?
   a.1/750 b.1 /1600 c.1/7500d.1/9000
2) Iftheeffectivelengthofa column is twice the actuallength, thenthe column is _____
   a. fixed atboththe ends b.hingedatboththe ends
   b. fixedatoneendandfreeattheother endd.fixedatoneendandhingedattheother end
3) Whatisthesafe loadactingona longcolumnof2mhavingdiameterof40 mm. Thecolumn is fixed at boththe ends and modulus ofelasticity is 2 x10^5 N/mm^2?(F.O.S = 2)
   a.120Kn b.124 kN c.130kNd.150kN
4) Rankine-Gordon'sempiricalformula isapplicable for _____

a.longcolumnb.shortcolumnc.botha.andb. d.noneofthe above

5) While determiningcrippling load, theeffective lengthofsolidcircular bar is1/√2ofactual length if, _____
   a. bothendsofsolidcircularbar arefixedb.bothendsofsolidcircularbararehinged
   b. c.oneendis fixedandoneisfree d.oneendisfixedandotherendishinged

6) Whichofthefollowingassumptionsaremadeintorsiontheory?
   a. Shaftisperfectlystraightb.Materialoftheshaftisheterogeneous
   b. Twistcannotbe uniformalong thelengthoftheshaftd.Allofthe above

7) Torque andbending moment of100kN.mand200 kN.mactsonashaft whichhasexternal diameter twice of internal diameter. What is the external diameter of the shaft which is subjected to a maximum shear stress of 90 N/mm^2?
   a.116.5mmb.233.025 mmc.587.1 mmd.900mm

8) What is the maximum shear stress induced in a solid shaft of 50 mm diameter which is subjectedtobothbendingmomentand torqueof300 kN.mmand 200kN.mmrespectively?
   a. 9.11N/mm^2 b.14.69N/mm^2
   c.16.22N/mm^2 d.20.98N/mm^2

9) Whatistheshear stressactingontheouter surface ofahollowshaft subjectedtoatorqueof 100 Nm?(The inner and outer diameter ofthe shaftis 15 mmand 30 mmrespectively.)
   a.50.26 N/mm^2 b. 40.24N/mm^2 c.20.120 N/mm^2 d.8.74 N/mm^2

10) WhatistheS.I.unitoftorsionalrigidity?
   a.Nmb.N.m^2c.Nm/radian d.Noneoftheabove

UNIT-3

1) What is the maximumprinciple stress induced in a solid shaft of40 mmdiameter which is subjectedtobothbendingmomentand torqueof300 kN.mmand 150kN.mmrespectively?
   a.21.69 N/mm^2 b.28.1N/mm^2 c.50.57N/mm^2
   d.52.32 N/mm^2

2) Amember subjectedto coupleproducesrotationalmotionabout itslongitudinalaxiscalled as _
   a.torsion b.twisting moment c.botha.and b.d.noneoftheabove

3) Energystoredinabodywithinanelasticlimitiscalled as_____
   a.resilience b.strainenergy c.botha.andbd.noneofthe above

4) What isthestrainenergystoredinacubeof50mm, whenit issubjectedtoshearstress of 200 Mpa. (G = 100 Gpa) a. 25 Nmb. 75 Nmc. 125 Nmd. 150Nm

5) Modulusofresilienceisthe ratio of_____
   a. minimumstrainenergyandunitvolume b.maximumstressenergyandunitvolume
   c.proofresilienceandunitvolume d.resilienceandunitarea

6) Strainenergystoredinauniformbarisgivenas_____
   a.(σE/2A) b.(σL/2AE) c.(σ^2AL/4E) d.(σ^2AL/2E)

7) Macaulay's method isusedtodetermine _____
   a.deflectionb.strengthc.toughness d.allofthe above

8) Whichofthefollowingisadifferentialequation fordeflection?
a. dy / dx = (M/EI) b. dy / dx = (MI/E) c. d^2y / dx^2 = (M/EI) d. d^2y / dx^2 = (ME/I)

9) Theverticaldistance betweentheaxisofthebeambeforeandafter loadingat apoint is called as _____
a. deformation b. deflection c. slope d.noneofthe above

10) Thedesignofabeamisbasedonstrengthcriteria,ifthebeamissufficientlystrongtoresist
a.shearforce b.deflection c.botha.and b.
d.none oftheabove

11) Asimplysupportedbeamcarriesuniformlydistributedloadof20kN/moverthelengthof 5 m.Ifflexuralrigidityis30000 $kN.m^2$,whatisthemaximumdeflectioninthebeam?
a.5.4mm b. 1.08mm c.6.2mm d.8.6mm

UNIT-4

1) Whyare shearconnectors used?
a. Interconnectplanks b.Toavoidslidingbetweenplanks
c.Botha.and b. d.Noneoftheabove

2) What isthe average shear stressacting ona rectangular beam, if50 N/mm^2 isthe maximum shear stress acting on it?
a.31.5 N/mm^2 b. 33.33N/mm^2 c.37.5 N/mm^2 d.42.5 N/mm^2

3) Theratio ofmaximumshear stresstoaverageshear stressis4/3in_____
a. circularcross-section b.rectangularcross-section
c. squarecross-section d.alloftheabove

4) Whatistheshear stressacting alongthe neutralaxisoftriangular beamsection, with base60 mmand height 150 mm, when shear force of 30 kN acts?
a.15.36 N/mm^2 b. 10.6N/mm^2 c.8.88N/mm^2
d.Insufficientdata

5) Acircular pipe issubjectedto maximumshear forceof60kN.What isthediameterofthe pipe if maximum allowable shear stress is 5 Mpa?
a.27.311mm b. 75.56mm c.142.72mm
d.692.10mm

6) Whichofthe following laminas have same momentofinertia($I_{xx}=I_{yy}$), whenpassedthrough the centroid along x-x and y-y axes?
a.Circle b.Semi-circle c.Rightangletriangle
d.Isoscelestriangle

7) Thebendingformulaisgivenas _____
a. (M/E)=(σ/y) =(R/I)b.(M/y) =(σ/I) =(E/R)
c.(M/I)=(σ/y)=(E/R)d.noneofthe above

8) A uniformly distributed load of 20 kN/m acts on a simply supported beam of rectangular crosssectionofwidth20 mmanddepth60 mm. What isthe maximumbendingstressacting on the beam of 5m?
a. 5030Mpa b.5208 Mpa

c.6600Mpa d.Insufficientdata

9) Whatistheproductofsectionalmodulusandallowablebendingstresscalledas?
a.Moment ofinertiab.Momentofrigidityc.Momentofresistanced.Radiusofgyration

10) Moment ofinertia acting onasemi-circle about symmetricalaxesisgivenas_____
a.$1.57r^4$ b.$0.055r^4$ c.$0.392r^4$ d.$0.11r^4$

UNIT-5

1) Whenarectangular barisuniaxiallyloaded, thevolumetricstrain(e_v)isgivenas_____
a.$\sigma_x/E(1-\mu)$ b.$\sigma_x/E(1+\mu)$ c.$\sigma_x/E(1-2\mu)$
d.$\sigma_x/ E(1+2\mu)$

2) Whatisthebulk modulusofa material, ifacubeof100 mmchanges itsvolumeto 4000 $mm^3$when subjected to compressive force of 2.5 x 10^6 N?
a.62.5Gpa b.65 Gpa c.67.5Gpa d.70Gpa

3) Therelationbetweenmodulusofelasticity(E),modulusofrigidity(G)and bulkmodulus (K)isgivenas _____
a. K+G / (3K+ G) b. 3 KG / (3K+ G) c.3 KG / (9K+ G) d. 9 KG / (3K+ G)

4) Modulusofrigidityistheratioof_____
a. Lateralstrainandlinearstrain b.Linearstressandlateralstrain

c.Shearstressandshearstraind.Shearstrainandshear stress

5) Inmaximumprinciplestraintheory,maximumprincipalstrainfornofailureconditionis
a. $e=(\sigma_x-\sigma_y)/E+\tau^2$ b.$e=q_{max}\geq q_{yp}$
c.$e= \sigma_{yp}/E$ d.noneoftheabove

6) Whichtheorygivessatisfactoryresultsforbrittlematerials?
a. Maximumshearstresstheory b.Maximumprinciplestresstheory

c.Shearstrainenergytheoryd.None oftheabove

7) Insimple tensile test,when maximumprinciple stressreachesthe value ofyield point,the material subjected to complex stresses fail. This theory is called as_____.
a. Coulumb's theory b. Rankine's theory c.Venant's theory d. Von Mises theory

8) According to Coulomb's theory, material subjected to complex stresses fails, if _____ shear stress induced in the material exceeds_____shear stress at the yield point.
a. minimum,maximumb. maximum,minimumc.maximum,maximumd.minimum,minimum

9) St. Venant's theory is alsoknownas maximum_____
a. principlestresstheory b.shearstresstheory
c.principlestraintheory d.strainenergytheory

XII. GATEQUESTIONS:

1) InMohr'scirclemethod, compressive directstressisrepresentedon_____
a.positivex-axis b.positivey-axis c.negativex-axis d.negativey-axis

2) The graphicalmethodofMohr'scircle representsshearstress(τ)on_____
a.X-axis b.Y-axis c.Z-axis d.Noneoftheabove

3) Whichofthefollowingstressescanbedeterminedusing Mohr'scirclemethod?
a.Torsionalstress b.Bending stress c.Principalstress d.Allofthe above

4) Principalstressisthemagnitudeof_____stressacting ontheprincipalplane.
a.Normalstress b. Shear stress c. Botha.andb.d.None oftheabove

5) Whatistherelationbetweenactuallengthandeffective lengthwhiledeterminingcrippling load for a hollow rectangular cast iron column having bothends fixed? (whereL=actuallengthandL_e=effectivelength)
a.L_e= L b.L_e= L/2 c.L_e= 2L d.L_e= 4L

6) Slendernessratioisthe ratioofeffectivelengthofcolumnand _____
a. lateraldimensionofacolumn
b. leastradiusofgyrationofa column
c. maximumradiusofgyrationofacolumn d.none oftheabove

7) Euler's formulaisapplicableonly_____
1.forshort columns2.for longcolumns3.ifslendernessratioisgreaterthan$\sqrt{(\pi^2 E / \sigma_c)}$
4. ifcrushingstress<bucklingstress5.ifcrushing stress≥buckling stress
a.1,2and 3 b.2,3and 5 c.3and4 d.alloftheabove

8) InEuler's theory,long columns having the ratioof(L_e/LLD) ≥12 faildue to_____
a.crushing b.buckling c.botha.and b. d.none oftheabove

9) Whichofthefollowing relationrepresentstorsionalflexibility?
a. GJb.GLc.GJ/Ld.L/GJ

10) Whenarectangular barisuniaxiallyloaded, thevolumetricstrain(e_v)isgivenas_____
a.σ_x/E(1-μ) b.σ_x/E(1+μ) c.σ_x/E(1-2μ)
d.σ_x/ E(1+2μ)

IESQUESTIONS:

1) Theratio ofeffectivelengthandleastlateraldimensionfor shortcolumnis_____
a.>12 b.<12 c.≥ 12 d.none oftheabove

2) Stressinthe cross sectionofa shaftatthe centre _____
a. is zero b.decreaseslinearlytothemaximumvalue of
at outer surface

c.botha.and b. d.noneoftheabove

3) Whatistheshear stressactingontheouter surface ofahollowshaft subjectedtoatorqueof 100 Nm?(The inner and outer diameter ofthe shaft is 15 mmand 30 mmrespectively.)
a.50.26 N/mm^2 b. 40.24N/mm^2 c.20.120
N/mm^2 d.8.74 N/mm^2

4) WhatistheS.I.unitoftorsionalrigidity?
a.Nm b.N.m^2 c.Nm/ radian
d.Noneoftheabove

5) Whichofthefollowingrelationrepresentstorsionalflexibility?
a.GJb.GLc.GJ/Ld.L/GJ

6) Inthe relation($T/J = G\theta/L = \tau/R$),theletter Gdenotes modulus of_____
a.elasticity b.plasticityc.rigidityd.resilience

7) What is the proofresilience ofa square barof2500 mm^2 and 200 mmlong, whena loadof 150 kN is induced gradually? (Take $E = 150 \times 10^3$ Mpa)
a.45J b.8 J c.5.3J d.6J

8) What isthe maximumstress induced ina bar2500mm^2, whena loadof2000kN isapplied suddenly?
a.400N/mm^2b.800N/mm^2c. 1600N/mm^2d.Insufficientdata

9) Whatisthestrainenergystoredinasimplysupported beamdueto bendingmoment?
a.$\int(M^2/EI)$b.$\int(M^2/2EI)$c.$\int(M/2EI)$d.$\int(2M/EI)$

10) Stress on an object due to sudden load is_____thestressinducedwhentheloadis applied gradually.
a.equalto b.half c.twice d. thrice

11) Whatisthestrainenergycaused duetoselfweightinacylindricalbar?
a.$(W^2L)/(6AE)$b.$(WL)/(8AE)$c.$(\tau^2/2G)V$d.$(\tau^2/G)V$

XIII. WEBSITES:

1. http://www.asce.org
2. http://www.icivilengineer.com
3. http://www.construction-guide.in
4. http://nptel.ac.in/courses/112105171/1

EXPERTDETAILS:

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5. Dr P.Laxminarayana, Head, Dept.ofMechanicalEngineering, Osmania UniversityCollege of Engineering, Hyderabad
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XV. JOURNALS:

1 ThesisDigest oncivilEngineering
2 InternationalEngineering andTechnologyJournalofCivilandStructure
3 Internationaljournalofcivilengineering
4 Journalofinformationknowledgeandresearch in civilengineering
5 Internationaljournalofcivilengineeringandtechnology
6 InternationalJournalofCivilEngineeringandApplications
7 RecentTrendsinCivilEngineeringandTechnology
8 WorldResearchJournalofCivilEngineering
9 InternationalJournalofStructuralandCivil Engineering
10 InternationalJournalofCivilEngineering(IJCE)
11 InternationalJournalofStructuralandCivilEngineeringResearch

12 InternationalJournalofAdvancedResearchinCivil,Structural,Environmentaland Infrastructure Engineering and Developing

XVI.LISTOFTOPICSFORSTUDENTSEMINARS:

1. Stress
2. Strain
3. Shearcentre
4. Neutralaxis
5. Symmetricalbending
6. Bendingmoment
7. Lamestheory
8. Cylindricalshells
9. Thickcylinders
10. Thincylinders
11. Curvedbeams
12. Springs