STRUCTURALANALYSIS–I(CE405PC) COURSE PLANNER

I. COURSEOVERVIEW:

Civil Engineers are required to design structures like buildings, dams, bridges, etc. This course is intended to introduce the basic principles to impart adequate knowledge and successfully apply fundamentals of Structural Engineering within their chosen engineering application area. Take advantage of a strong technical education at the undergraduate level to embark onsuccessfulprofessionalcareers in industryorto continue witha graduate education in their area of specialization. Apply broad multi-disciplinary skills necessary to accomplish professional objectives in a rapidly changing technological world.

II. PREREQUISITE(S):

Level	Credits	Periods/Week	Prerequisites
UG	3	4	StrengthofMaterials–I

III. COURSEOBJECTIVES:

Theobjectiveofthecourseisto

1. Differentiatethestaticallydeterminateandindeterminatestructures.
2. Tounderstandthenatureofstressesdeveloped inperfect framesandthreehinged arches for various types of simple loads
3. Analyzethestaticallyindeterminatememberssuchasfixedbars, continuous beams and for various types of loading.
4. Understand theenergymethodsusedto derivetheequationstosolveengineering problems
5. EvaluatetheInfluenceonabeamfordifferentstatic&movingloading positions

IV. COURSE OUTCOMES:

Atthe end ofthecoursethestudentwillableto

1.Anabilitytoapplyknowledgeofmathematics, science,andengineering	Understand
2.Analyzethestaticallyindeterminatebarsand continuousbeams	Analyze
3.Drawstrengthbehaviorofmembersforstatic anddynamicloading.	Understand
4.Calculatethestiffnessparametersinbeamsand pinjointedtrusses.	Apply
5.Understand the indeterminacy aspects to considerforatotalstructuralsystem.	Understand
6.Identify,formulate,andsolveengineering problemswithrealtimeloading	Analyze

V. HOWPROGRAMOUTCOMESAREASSESSED:

ProgramOutcomes		Level	Proficiency assessedby
PO1	An ability to apply knowledge of computing, mathematical foundations,algorithmicprinciples,andcomputerscienceand engineering theory in the modeling and design of computer-based systems to real-world problems (**fundamental engineering analysis skills)**	**3**	Assignments, Tutorials.
PO2	Anabilityto designandconduct experiments, aswellasto analyze and interpret data **(information retrieval skills)**	**3**	Assignments, Tutorials,Exams.
PO3	Anabilitytodesign, implement ,andevaluateacomputer-An abilityto design , implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability **(Creative Skills)** ,andsustainability**(CreativeSkills)**	**1.16**	Assignments, Tutorials,Exams
PO4	Anabilitytofunctioneffectivelyon multi-disciplinaryteams **(teamwork)**	**1.16**	--
PO5	Anabilitytoanalyzeaproblem,identify,formulateandusethe appropriatecomputingandengineeringrequirementsforobtaining its solution **(Engineering problem solving skills)**	**3**	Assignments, Exams
PO6	An understandingof professional,ethical,legal,security and social issues and responsibilities **(professional integrity)**	**-**	--
PO7	Anabilitytocommunicateeffectivelybothinwritingand orally**(speaking/ writingskills)**	**-**	--
PO8	The broad education necessary to analyze the local and global impact ofcomputing and engineering solutions on individuals, organizations,andsociety(**engineeringimpactassessment skills)**	**0.5**	Assignments, Exams. .
PO9	Recognitionoftheneedfor,andanabilitytoengagein continuingprofessionaldevelopmentand life-long learning **(continuingeducation awareness)**	**1**	Assignmentsand Exams
PO10	AKnowledge ofcontemporaryissues(**socialawareness)**	**0.5**	Assignments
PO11	Anabilitytousecurrenttechniques,skills,andtoolsnecessary forcomputingandengineeringpractice(**practicalengineering analysis skills**)	**1.33**	Assignmentsand Exams
PO12	An ability to apply design and development principles in the construction of software and hardware systems of varying complexity **(software hardware interface)**	**1**	--

N-None **S-Supportive** **H-High**

VI. HOWPROGRAMSPECIFICOUTCOMESAREASSESSED:

ProgramSpecificOutcomes		Level	Proficiency assessedby
PSO1	**UNDERSTANDING:** Graduates will have an ability to understand, analyze and solve problems using basic mathematicsandapplythetechniquesrelatedtoirrigation, structural design, etc.	**2.16**	Assignments, Tutorials, Exams
PSO2	**ANALYTICAL SKILLS:** Graduates will have an ability to design civil structures, using construction components and to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safetymanufacturabilityandreliabilityandlearntoworkwith multidisciplinaryteams.	**2**	Projects
PSO3	**BROADNESS:** Graduateswillhaveanexposuretovarious fields ofengineering necessary to understand the impact of other disciplinesoncivilengineering blueprints in a global, economic, and societalcontext and to have necessary focus forpostgraduateeducationandresearchopportunitiesat globallevel.	**0.5**	GuestLectures

VII. SYLLABUS:

UNIT– I
ANALYSIS OFPERFECTFRAMES:
Types of frames - Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT– II
ENERGYTHEOREMS:
Introduction-Strainenergyin linear elastic system, expressionofstrainenergydueto axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method – Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames. THREE HINGED ARCHES – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem – Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment – Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

UNIT-III
PROPPEDCANTILEVERandFIXEDBEAMS:
Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia – subjected to uniformlydistributed load - point loads - uniformlyvarying load, couple and combinationof loads-Shearforce,Bendingmomentdiagramsandelasticcurveforpropped Cantileverand FixedBeams-Deflection ofProppedcantileverandfixedbeams-effectofsinkingofsupport,

effectofrotationofasupport.

UNIT–IV CONTINUOUS BEAMS:

Introduction-Continuous beams - Clapeyron's theorem of three moments Analysis continuousbeamswithconstant andvariable momentsofinertiawithoneorbothends fixed-continuous beams with overhang - effect of sinking of supports

SLOPEDEFLECTION METHOD:

Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports - Determination of static and kinematic indeterminacies for frames – Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway- Shear force and bending moment diagrams and Elastic curve.

UNIT– V

MOVINGLOADSandINFLUENCELINES:

Introduction maximumSF and BM at a given section and absolute maximumshear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed loadFocal length – Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformlydistributed load shorterthan the span- Influence lines for forces in members of Pratt and Warren trusses - Equivalent uniformly distributed load -Focal length.

TEXTBOOKS:

1. StructuralAnalysisVol–I&IIbyV.N. Vaziraniand M.M.Ratwani,Khanna Publishers.
2. StructuralAnalysisVolI &II byG.S.Pandit and S.P. Gupta,Tata McGraw HillEducation Pvt. Ltd.
3. StructuralanalysisT. SThandavamoorthy,OxforduniversityPress

REFERENCES:

1. StructuralAnalysis byR. C.Hibbeler, PearsonEducation
2. BasicStructuralAnalysis byK.U. Muthuetal.,I.K. InternationalPublishingHousePvt.Ltd
3. MechanicsofStructuresVol– I andII byH.J. Shahand S.B. Junnarkar, CharotarPublishing House Pvt. Ltd.
4. BasicStructuralAnalysisbyC.S.Reddy.,TataMcGrawHillEducationPvt.Ltd.
5. FundamentalsofStructuralAnalysis byM.L.Gamhir, PHI LearningPvt.Ltd

NPTELWEBCOURSE:

http://nptel.ac.in/courses/105104101/

NPTELVIDEOCOURSE:

http://nptel.ac.in/courses/105104101/#

RELEVANTSYLLABUS FOR GATE

Analysis of statically determinate trusses, arches, beams, cables and frames, displacements instatically determinate structures and analysis of statically indeterminate structures by force/energy methods, analysis by displacement methods (slope deflection and moment distributionmethods), influence lines for determinate and indeterminate structures. Basic concepts ofmatrixmethods of structural analysis.

RELEVANTSYLLABUS FOR IES

Analysisofdeterminatestructures - different methodsincludinggraphicalmethods. Analysis of indeterminate skeletal frames - moment distribution, slope-deflection, stiffness and force methods, energy methods, Muller-Breslau principle and application. Plastic analysis of indeterminate beams and simple frames - shape factors.

VIII. COURSEPLAN:

Lecture No.	Unit	DATE	Topicstobecovered	LinkforPPT	LinkforPDF	Course learning outcomes	TeachingMethodoly	References
1.	1		**ANALYSIS OF PERFECTFRAMES:** Typesofframes	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand about the frames	PPT/ PDF	R1, R2, R3
2.			Perfect, Imperfect, Redundantpin jointed plane frames	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand perfect, imperfect, pinjointed frames	PPT/ PDF	R1, R2, R3
3.			Analysisof determinate pinjointedplane frames using methodofjoints	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Understanding support reactions	PPT/ PDF	R1, R2, R3
4.			StudentPresentation			Ableto communicate	PPT/ PDF	R1, R2, R3
5.			methodofsections	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Understandin gsupport reactions	PPT/ PDF	R1, R2, R3

6.			tension coefficient method for vertical loads, horizontal loads andinclinedloads.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Understanding support reactions	PPT/ PDF	R1, R2, R3
7.			tension coefficient methodforvertical loads, horizontal loads and inclined loads.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Understanding support reactions	PPT/ PDF	R1, R2, R3
8.			StudentPresentation			Able to communicate	PPT/ PDF	R1, R2, R3
9.			tension coefficient method for vertical loads, horizontal loads andinclinedloads.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Understanding support reactions	PPT/ PDF	R1, R2, R3
10.	2		ENERGY THEOREMS: Introduction-Strain energy in linear elastic system	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Relation between stress strainsin linear elastic system	PPT/ PDF	R1, R2, R3
11.			expression of strainenergydueto axial load, bending moment and shear forces	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Stress &strain relation due to axialload	PPT/ PDF	R1, R2, R3
12.			StudentPresentation			Able to communicate	PPT/ PDF	R1, R2, R3
13.			Castigliano's theorem	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand castigliano's teorem	PPT/ PDF	R1, R2, R3
14.			UnitLoad Method	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=shar	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand Unit Load Method	PPT/ PDF	R1, R2, R3

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15.			Deflectionsof simplebeams andpin-jointed plane frames	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand deflections in simpleand pinjointed frames	PPT/ PDF	R1, R2, R3
16.			StudentPresentation			Able to communicate	PPT/ PDF	R1, R2, R3
17.			Deflectionsof statically determinatebent frames	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand Deflection sof statically determinat e bent frames	PPT/ PDF	R1, R2, R3
18.			THREE HINGEDARCHES – Introduction– TypesofArches	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toknow about arches	PPT/ PDF	R1, R2, R3
19.			Comparison between Three hingedandTwo hinged Arches - Linear Arch	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To know about Compariso n between Three and Two &linear hinged Arches	PPT/ PDF	R1, R2, R3
20.			Comparison between Three hingedandTwo hinged Arches - Linear Arch	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To know about Compariso n between Three and Two &linear hinged Arches	PPT/ PDF	R1, R2, R3

21.			Eddy'stheorem	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand eddy's theorem	PPT/ PDF	R1, R2, R3
22.			AnalysisofThree hinged arches	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand three hinged arches analysis	PPT/ PDF	R1, R2, R3
23.			Normal Thrust andradialshearand bending moment	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toanalyze three hinged arches	PPT/ PDF	R1, R2, R3
24.			StudentPresentation			Able to communicate	PPT/ PDF	R1, R2, R3
25.			Geometrical properties of parabolic and circulararches	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand Geometrical properties of parabolic and circular arches	PPT/ PDF	R1, R2, R3
26.			Three hinged parabolic circular arches having supportsatdifferent levels.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Analysis of three hinged arches	PPT/ PDF	R1, R2, R3
27.			Three hinged parabolic circulararches havingsupportsat different levels.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Analysis of three hinged arches	PPT/ PDF	R1, R2, R3

28.			Three hinged parabolic circular arches having supportsatdifferent levels	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Analysis of three hinged arches	PPT/ PDF	R1, R2, R3
29.	3		UNIT - III PROPPED CANTILEVE RandFIXED BEAMS: Determination of staticandkinematic indeterminaciesfor beams	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To determine static and kinematic indeterminaci es of beams	PPT/ PDF	R1, R2, R3
30.			Analysisof Proppedcantilever	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis ofpropped cantilever	PPT/ PDF	R1, R2, R3
31.			fixed beams, including the beams with differentmoments of inertia	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toknow fixed beams andbeams with different moments ofinertia	PPT/ PDF	R1, R2, R3
		Imidexams						
32.			subjected to uniformly distributed load - point loads - uniformlyvarying load	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To know aboutUDL and point loads,UVL	PPT/ PDF	R1, R2, R3

33.			subjected to uniformly distributed load - point loads - uniformlyvarying load	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To know aboutUDL and point loads,UVL	PPT/ PDF	R1, R2, R3
34.			couple and combination of loads-Shearforce, Bending moment diagrams	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toknow about couple, SF,BM	PPT/ PDF	R1, R2, R3
35.			elasticcurvefor Propped Cantileverand Fixed Beams	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand elastic curves	PPT/ PDF	R1, R2, R3
36.			Student Presentation	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing		PPT/ PDF	R1, R2, R3
37.			Deflection of Proppedcantilever and fixed beams -	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand deflection inPCB,FB	PPT/ PDF	R1, R2, R3
38.			effect of sinking of support, effectofrotationof asupport.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toknow about effect of sinking, rotation	PPT/ PDF	R1, R2, R3
39.			effectofsinkingof support, effect of rotation of a support.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Toknow about effect of sinking, rotation	PPT/ PDF	R1, R2, R3
40.	4		UNIT – IV CONTINUOUS BEAMS: Introduction-Continuousbeams	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand continuous beams	PPT/ PDF	R1, R2, R3
41.			Clapeyron's theoremofthree moments	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=shar	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand clapeyron's theorem	PPT/ PDF	R1, R2, R3

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42.			Analysisof continuousbeams withconstantand variable momentsofinertia with one or both ends fixed	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis ofCB	PPT/ PDF	R1, R2, R3
43.			Analysisof continuous beams with constant and variable moments ofinertiawithone orbothendsfixed	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis ofCB	PPT/ PDF	R1, R2, R3
44.			Student Presentation	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Able to Communicate	PPT/ PDF	R1, R2, R3
45.			continuous beams with overhang-effectofsinkingof supports.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis ofCBwith effect of sinking supports	PPT/ PDF	R1, R2, R3
46.			SLOPE DEFLECTION METHOD: Derivationofslope	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand derivation of slope	PPT/ PDF	R1, R2, R3
47.			deflection equation	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand derivation of deflection	PPT/ PDF	R1, R2, R3
48.			application to continuous beams with and without sinkingofsupports	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis ofCB	PPT/ PDF	R1, R2, R3

49.			Determination of static and kinematic indeterminaciesfor frames	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis offrames forstatic and KI	PPT/ PDF	R1, R2, R3
50.			AnalysisofSingle Bay,Singlestorey Portal Frames by Slope Deflection Method including Side Sway	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis offrames withside sway	PPT/ PDF	R1, R2, R3
51.			Shearforceand bending moment diagrams andElasticcurve.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand analysis offrames of SF,BM,EC	PPT/ PDF	R1, R2, R3
52.			StudentPresentation	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	Able to Communicate	PPT/ PDF	R1, R2, R3
53.	5		INFLUENCE LINES: Introduction	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing		PPT/ PDF	R1, R2, R3
54.			maximumSF andBMatagiven section	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BM	PPT/ PDF	R1, R2, R3
55.			absolute maximum shear forceandbending moment due to singleconcentrated load	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BM forsingle concentrated load	PPT/ PDF	R1, R2, R3

56.			uniformly distributed load longerthanthespan and shorter than span	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BM forUDL	PPT/ PDF	R1, R2, R3
57.			two point loads with fixed distancebetween themandseveral pointloads	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand two point loads with fixed distance	PPT/ PDF	R1, R2, R3
58.			Equivalent uniformly distributed loadFocallength	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BM for EDL	PPT/ PDF	R1, R2, R3
59.			Definition of influencelinefor shear force and bending moment - load position for maximum shear forceandmaximum bending Moment at asection-	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BMat a section	PPT/ PDF	R1, R2, R3
60.			uniformly distributedload	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BMat UD load withlonger span	PPT/ PDF	R1, R2, R3
61.			Influencelines for forces in members ofPrattandWarren trusses -	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BMat UD load with shorter span	PPT/ PDF	R1, R2, R3

62.			Equivalent uniformly distributedload-Focal length.	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	https://drive.google.com/drive/folders/1IvaJYQiMejwaSh4dUPBQ2jc1d5yqV77e?usp=sharing	To understand max SF&BMat UV load	PPT/ PDF	R1, R2, R3

IX. MAPPINGCOURSEOUTCOMESLEADING TOTHEACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CO's	ProgramOutcomes												ProgramSpecific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	3	-	-	1	1	-	3	2	3	2	1
CO2	3	3	1	1	3	-	-	-	2	1	-	2	2	2	-
CO3	3	3	1	1	3	-	-	-	-	-	2	1	2	2	-
CO4	3	3	2	1	3	-	-	1	1	-	3	3	2	2	-
CO5	3	3	1	1	3	-	-	-	1	1	-	-	2	2	1
CO6	3	3	1	1	3	-	-	1	1	1	-	-	2	2	1
AVG	**3**	**3**	**1.16**	**1.16**	**3**	-	-	**0.5**	**1**	**0.5**	**1.33**	**1**	**2.16**	**2**	**0.5**

Small(S)-1 **Medium(M)-2** **High(H)-3**

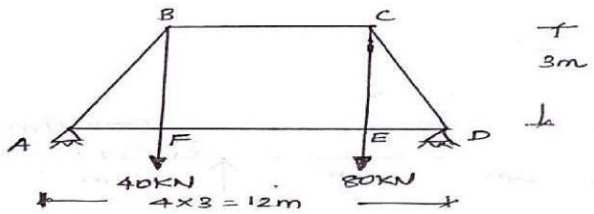
X. QUESTIONBANK: (JNTUH)

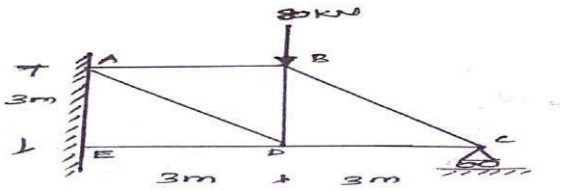
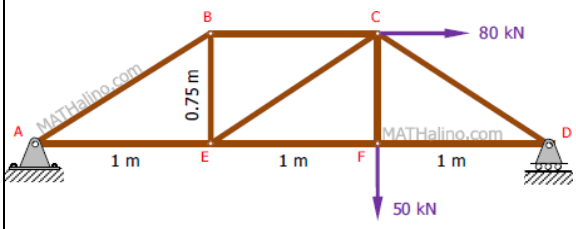
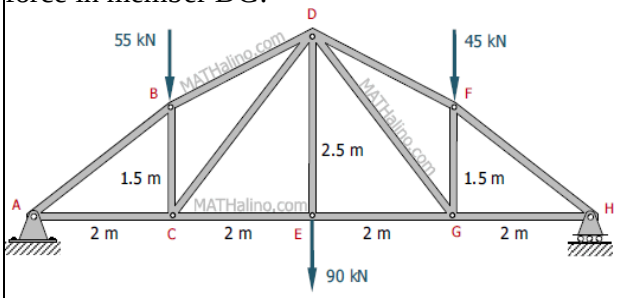
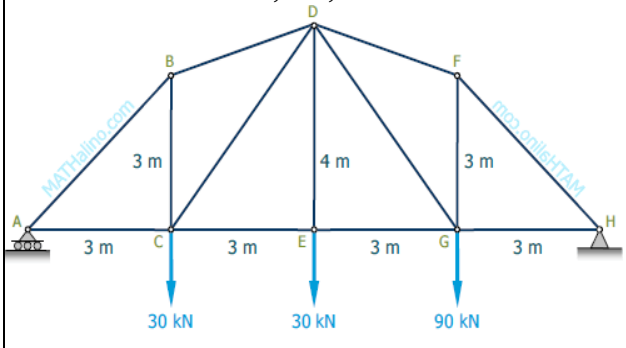
UNIT– I

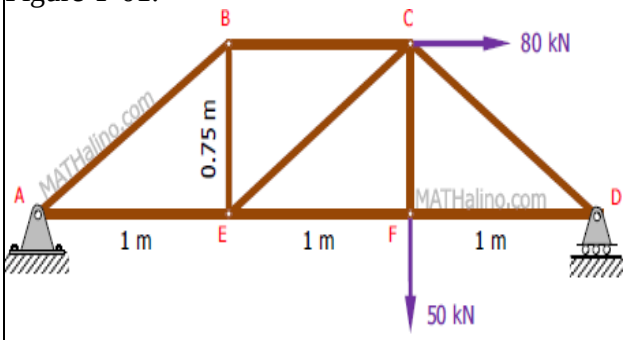
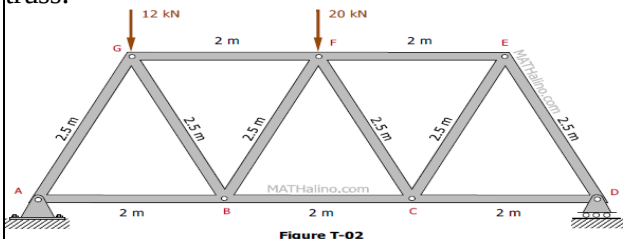
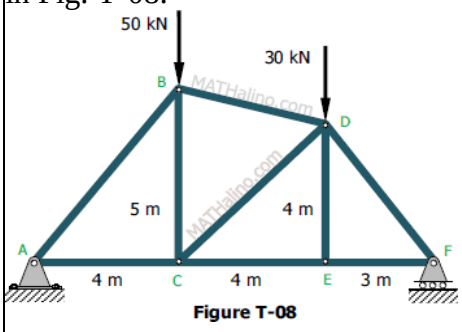
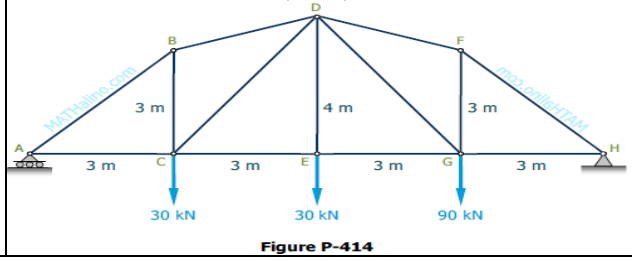
SHORTANSWER QUESTIONS.

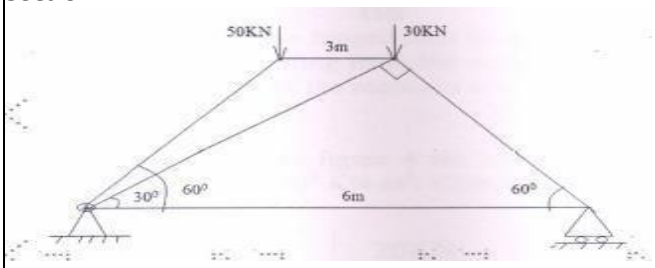
S.No	Question	Blooms Taxonomy Level	Program Outcome
1.	Explaintypesofframes.Perfect,Imperfect and Redundant frames?	Understanding	1
2.	Define frame?	Understanding	1
3.	Whatisequilibriumofplaneframes?	Understanding&remembering	1
4.	ExplainMethodsofanalysisofDeterminate pin jointed frames?	Understanding&remembering	1
5.	What istheprocedureforanalysisoframeusing Method of section?	Understanding&remembering	1
6.	What istheprocedureforanalysisoframeusing Method of joints?	Understanding&remembering	1
7.	Howto analysetheframeusingMethodof Tension coefficientmethod?	Understanding&remembering	1
8.	Howtoanalysetheframeforvertical, horizontal and inclined loads?	Understanding&remembering	1
9.	Differentiatebetweenpinjointandrigid joint	Understanding&remembering	1
10.	Differentiatebetweenmethodofjointsandmethod ofsections?	Understanding&remembering	1

LONG ANSWER QUESTIONS.

S.No	Question	BloomsTaxonomy Level	Progam Outcome
1	Identifythe forces inthemembers ofthetruss shown in figure. The cross sectional area of vertical and horizontal members is 4000 mm2 and that of the diagonals is 6000mm2 	**Analyze&Apply**	**1**

2	Analyze the truss shown in figure by consistent deformation method. Assume that the cross-sectional areas of all members are same. 	**Analyze & Apply**	**1**
3	Fromthetrussin Fig.T-01,determinetheforcein mebers BC, CE, and EF.  **Figure T-01**	**Analyze & Apply**	**1**
4	The roof truss shown in Fig. T-03 is pinned at point A, and supported by a roller at point H. Determinethe force in member DG.  **Figure T-03**	**Analyze & Apply**	**1**
5	Determine the force in members AB, BD, and CD of the truss shown in Fig. P-414. Also solve for the force on members FH, DF, and DG.  **Figure P-414**	**Analyze & Apply**	**1**

6	Findtheforceactinginallmembersofthetruss shown in Figure T-01.  **Figure T-01**	**Analyze & Apply**	**1**
7	The structure in Fig. T-02 is a truss which is pinned to the floor at point A, and supported by a roller at point D. Determine the force to all members of the truss.  **Figure T-02**	**Analyze & Apply**	**1**
8	Computethe force inallmembersofthe truss shown in Fig. T-08.  **Figure T-08**	Analyze&Apply	1
9	Determine the force in members AB, BD, and CD ofthetrussshownin Fig.P-414.Also solve forthe force on members FH, DF, and DG.  **Figure P-414**	Analyze&Apply	1

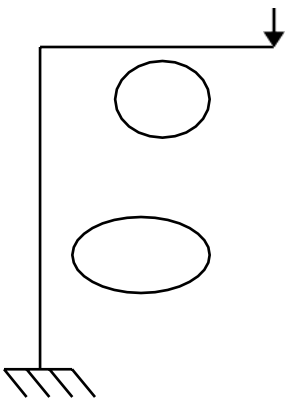
10	Determinetheforcesinthetrussusing methodof section 	Analyze&Apply	1

UNIT– II

SHORTANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out come
1	ExplainStrainEnergyMethod?	understanding	2
2	ExplainCastigliano'sMethod?	understanding	2
3	Whatisanarch?Explain	understanding	2
4	Distinguishbetweentwohingedandthree hinged arches?	understanding	2
5	Givetheequationforaparabolicarchwhose springing is at different levels?	Understanding	2
6	Explain the effect of temperature on the horizontal thrust of a two hinged arch subjected toa systemof vertical loads?	understanding	2
7	Indicate the positions of a moving point load for maximum negative and positive bending moments inathreehinged arch.	Remembering	2
8	Writedowntheexpressionsforradialshearand normal thrust in a three hinged parabolic arch?	Understanding	2
9	Defineradialshear andnormalthrust?	Understanding	2
10	Mention the examples where arch action is usually encountered?	Understanding	2

LONG ANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	Determine the deflection of the free end of a antilever of length L subjected toa concentrated oad P at the free end.	Analyze&Apply	2
2	A simply supported beam of varying depth is oadedwithapointloadat4mdistancefromsupport A is 60 kN. Determine the deflection under pointload. Given: Moment of Inertia up to 4mfromAisI and from4mto 8mis2I. Assume E s constant.	Analyze&Apply	2
3	Determine the vertical deflection of point C in the frame show in fig. below. Determine the vertical deflection at free end of a overhanging beam B C I 2I A 	**Analyze&Apply**	2
4	A three-hinged circular arch hinged at the springing and crownpoints has a spanof40 mand a central rise of 8 m. It carries a UDL of 20 kN/m over the left-half of the span together with a concentrated load of 100 kN at the right quarter span. Find Reactions at the supports NormalThrustShearatasectionfrom10mfromleft support	**Analyze&Apply**	2
5	A three-hinged circular arch hinged at the springing and crownpoints has a spanof25 mand a central rise of 5 m. It carries a Point load of 100 kN at 6 m from left support. Calculate	**Analyze&Apply**	2

6	ReactionsatthesupportsReactionsatCrownMoment at 5 m from the left support	**Analyze&Apply**	2
7	A three-hinged semi-circular arch of radius 'R' carries UDL of w/unit length over its entire horizontalspan.DetermineReactionsatthe supportsMaximumBendingMomentinthearch	**Analyze&Apply**	2
8	A symmetric three-hinged parabolic arch has a span of 36 m and a central rise of 6 m is subjected o a concentrated load of 120kN at a pointfromeft support. Draw Bending Moment Diagram	**Analyze&Apply**	2
9	A symmetric three-hinged parabolic arch has a spanof60mandacentralriseof12missubjectedto a concentrated load of40 kN acting at10mfromitsleftsupportandUDLof10 kN/mactingoveritsentireright-halfspan.Draw Bending momentDiagramforthearch.	**Analyze&Apply**	2
10	A three-hinged parabolic arch having supports at different levels i.e., support B is higher than 2 m support A, has a span of40mand a centralrise of5 m with reference to support A is subjected to an UDL of 30 kN/m acting over its entire left-half span. Determine Horizontal Thrust developed Bending Moment, NormalThrust and RadialShear Force developed at a section of 15 m from the left support Show that the parabolic shape is afunicular shape for athree-hinged archsubjectedto a uniformly distributed load over to its entire span	Analyze&Apply	2

UNIT– III

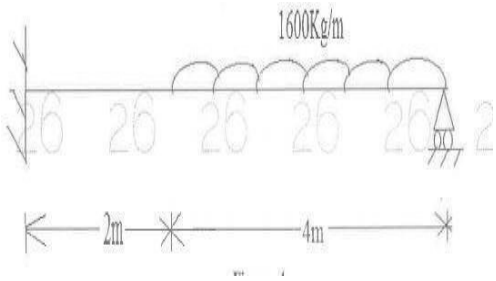
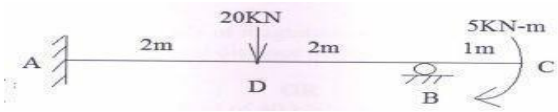
SHORTANSWERQUESTIONS.

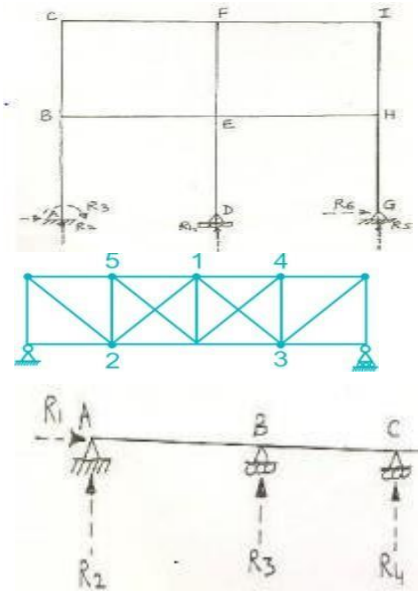
S.No	Question	Blooms Taxonomy Level	Program Out come
1	Whatisa Prop?	Understanding	3 3
2	HowtoanalysisProppedCantileverandFixed beams?	Understanding	3
3 3	What arethe methodsto calculate analysisof Propped Cantilever and Fixed beams?	Understanding	3 3
4	Give the relation between number of joints, numberofmembers, inaperfect frame inplane and space structures	Understanding	3

5	Explainthe typesofstructures	Understanding	3 3
6	Explainthedifferent typesofpropswiththe sketches	Understanding	3
7	Ina memberAB ifa moment of10kN-misapplied at A whats the moment carried over to the fixed support B.	Understanding	3 3
8	How fixed beam can be made statically determinate?	Understanding	3
9	Whatishinge?Howreactionswillbecalculated?	Understanding	3 3
10	Howhinged beamcanbe madestatically determinate?	Understanding	3

LONG ANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	Afixed beamoflength3missubjectedtotwo point loads9KNatthemiddlethirdpoint.Calculate Bendingmomentatthefixedend	Analyze&Apply	3 3
2	Calculatedeflectionatmidspanforapropped cantileverbeamofload10Kn/mforaspanof4m	Analyze	3
3	Calculate maximumbending moment for apropped cantilever beamwhichcarriesaudlof10Kn/mfor a span of 2m.	Analyze	3 3
4	Calculate point of contra flexure for propped cantilever beamhasa4mlengthcarriespoint load of 20KN at free end	Analyze&Apply	3

5	Acantilever oflength8mcarries udlof2Kn/mrun over the whole length. The cantilever is propped rigidly at the free end. If E=10^5N/mm2 and I=10^8 mm^4, then determine reaction at the rigid prop and deflection at the center	Analyze&Apply	3 3
6	Analysetheproppedcantilever,duringtheloading thefixedendsupport isrotatedby0.002radiansin anticlockwise direction. Draw BMD 	Analyze&Apply	3
7	A fixed beam AB oflength 6mcarries a uniformly distributedload3kn/moverthe left halfofthespan togetherwithapointloadof4knatadistanceof 4.5m from the left end. Determine the fixing end moments and support reactions.	Analyze&Apply	3 3
8	Determinethereactionsofproppedcantileverbeam shown and draw BMD 	Analyze&Apply	3
9	Acantilever oflength8mcarries udlof10Kn/mrun over the whole length. The cantilever is propped rigidly at the free end. If E=20X10^5N/mm2 and I=10^8 mm^4,then determine reaction at the rigid prop and deflection at the center.	Analyze&Apply	3 3

10	Findthestaticandkinematic indeterminaciesofthe below 	Analyze&Apply	3

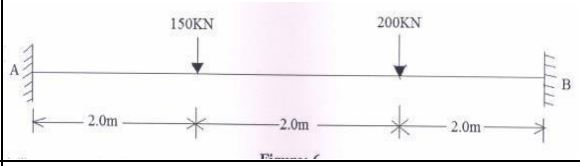
UNIT– IV

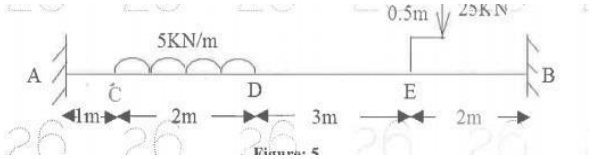
SHORTANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out come
1	ListoutAssumptionsmadeinSlopeDeflection Method of analyzing Indeterminate structures	understanding	4
2	ExplainSlopeDeflectionEquations	understanding	4
3	Staterelativemeritofmoment distributionmethod over slope deflection method.	remembering	4
4	Namethethreeclassicalforcemethodsused inthe analysis of continuous beams	remembering	4
5	Whatarethelimitationsofslopedeflectionmethod?	understanding	4
6	Writedowntheequilibriumequationsused inslope deflection methods?	remembering	4
7	Whyisslopedeflectionequationmethodknownas stiffness method?	understanding	4

8	Howto AnalyseofContinuousbeamswithoneend is fixed and other end is simply supported.	Analyze&Apply	4
9	Howto AnalyseofContinuousbeams withboth ends are supports simply supported.	Analyze&Apply	4
10	AnalysisofContinuousbeamswithoverhang atone end.	Analyze&Apply	4

LONG ANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	Analyse the two span continuous beams and draw BMD, SFD, and Elastic Curve. Assume E is constant.AB=4m,BC=6m,UDLoverspanBC is 20kN/m, CentralPoint LoadonSpanAB is40 KN, Moment of Inertia ofbeam AB is I and BC is 2I	Analyze&Apply	4
2	Analyse the two span continuous beams and draw BMD, SFD, and Elastic Curve. Given: EI = 4000 kN-m^2, AB = 8m, BC = 4m, UDL over span AB is 20kN/m, CentralPoint LoadonSpanBC is60kN. Both ends A and C are fixed. EI for span AB is 2 times of span BC.	Analyze&Apply	4
3 3	For the beam shown below If he left support and right support sinksby15mmand 7mmrespectively find momentsandreactionsat supportsDrawBMD EI=6000Kn-m2 	Analyze&Apply	4
4	Analyse the two span continuous beams and draw BMD, SFD, and Elastic Curve. Assume E and I is constant.AB=6m,BC=6m,UDLoverspanBC is 30kN/m, CentralPoint LoadonSpanAB is40 KN, Support A is fixed and C is simply supported.	Analyze&Apply	4

5	Analyse the two span continuous beams with overhang and draw BMD, SFD, and Elastic Curve. AssumeE isconstant.AB=6m,BC=4m,CD=2m. UDL over span AB is 20 kN/m, CentralPoint Load on span BC is 80 kN and Point Load of 40 kN is acting at D. BeamCD is overhanging beam	Analyze&Apply	4
6	Analyse the three span continuous beams and drawBMD,SFD,andElasticCurve.Given:AB =4m, BC=4m, CD =6m. UDLover spanAB is 30 kN/m, Central Point Load on span BC is 60 kN, and a Point load of 60 kN is acting at a distance of 2m from support B. Support A is Fixed and D is simply supported. Moment of Inertia: AB = BC = I, CD=2I	Analyze&Apply	4
7	Find fixed end moments and reactions and draw BMD for the beam shown below assumenecessary data 	Analyze&Apply	4
8	Analyse the three span continuous beams if support C sinks by 10mm and draw BMD, SFD, and Elastic Curve. Given: AB = 3m, BC = 6m, CD = 3m. UDL over span AB is 40 kN/m, a Point load of120 kN is acting at a distance of 2m from support B, an UDL of60kN/mis acting over spanCD. Bothends Aand D are fixed. Moment of Inertia: AB = CD = I, BC=2I. E= 2 x 10^5/mm^2.I = 4 x 10^7 mm^4.	Analyze&Apply	4
9	What aretheadvantagesofslope-deflection method over moment distribution method?	Remembering&Understanding	4
10	Definedistribution factorandcarryover factor in moment distribution method.	Remembering&Understanding	4

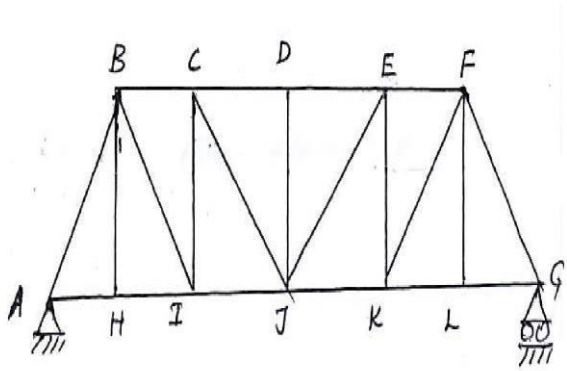
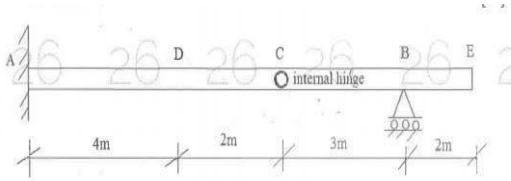
UNIT– V
SHORTANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	WhatismeantbyILD?	Understanding	5
2	Whataretheusesofinfluencelinediagrams?	Remembering	5
3	StateMullerBreslau'sprinciple.	Remembering&Understanding	5
4	In the context of rolling loads, what do you understandbythetermequivalent uniformly distributed load?	Remembering&Understanding	5
5	What isInfluencelineDiagramsforSimply Supported Beams	Understanding	5
6	What isInfluencelineDiagramsforCantilever Beams?	Understanding	5
7	What isInfluencelineDiagramsforOverhang Beams?	Understanding&remembering	5
8	What isInfluencelineDiagramsforDouble Overhang Beams?	Understanding	5
9	Whenaseriesofwheelloads movealongagirder, what is the condition for getting	Remembering&Understanding	5
10	WhatisMaximumbendingmomentunderanyone pointload?	Understanding	5

LONG ANSWERQUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Outcome
1	A single rolling load of 100 kN moves on a girder of span 20m. Construct the influence lines for (i) Shear force and (ii) Bending moment for a section 5m from the left support.	Analyze&Apply	5
2	Determine the influence line diagram for bending moment atapoint D,the middlepoint ofspanAB ofa continuous beam ABC of span AB=6m and BC=4m simplysupportedatsupportsA,BandC.Computethe ordinates atevery1minterval.	Analyze&Apply	5
3	Constructtheinfluencelinesforpointsatwhichthe maximumshearsandmaximumbendingmoment develop.Determinethesemaximumvalues.	Analyze&Apply	5

4	Derive the influence diagram for reactions andbending moment at any section of a simply supported beam. Using the ILD, determine the support reactions and find bending moment at 2m, 4m and 6m for a simply supported beam of span 8m subjected to three pointloadsof10kN,15kNand5kNplacedat1m, 4.5mand6.5mrespectively.	Analyze&Apply	5
5	Asimplysupported beamhas a spanof15 m. anUDL of 40 kN/m and 5 m long crosses the girder from left to right. Draw ILD for SF and BM at a section 6m from left end. Use these diagrams to calculate the maximumshearforceandbendingmomentatthis section.	Apply	5
6	Find Maximum SF & BM, and Absolute MaximumSF & BM values due to Moving Loads Single Point Load	Analyze&	5
7	A) Whatisaninfluence line? B) Draw the influence lines for various members ofa Pratt Truss with parallel chords	Understand & Practice	5
8	The warren girder of 25m span is made of 5 panels of 5m each. The diagonals are inclined at 60° to the horizontal. Draw the influence line diagram for force in upper chord member in the second panel from left. Henceevaluatetheforcesinitwhenthereisloadof 60kNateachlower joint.	Analyze&Apply	5
9	Two point loads of 100kN and 200kN spaced 3m apart cross a girder of span 12 meters from left to right with the 100kN leading. a. Draw the ILD for shear force and bending moment and find the values of maximum bending moment b. Find the values of maximum shear force and bending moment at a section 4m from the left hand support. 3. Evaluate the absolute maximum bending moment duetothe given loading system.	Analyze&Apply	5

10	Analysis the IL for force in member BC and CI for the truss shown in figure. The height of the truss is 9m and each segment is 9m long.  1. Determinethemaximumshear forcesandbendingm moment diagram 2. Calculate values at5mand 8m fromthe lefthand support. 3. DrawILDfor a) reactionVbatB b) reactionVaatA c) ShearforceatD d) BM at D find max values of these at LL of 20kN-m  	Analyze&Apply	5

XI. OBJECTIVEQUESTIONS:JNTUH

UNIT – I

1. Clastigliano'stheoremisappliedto
   a. Simplysupported beam b.Proppedcantileverbeam
   c. Fixed&continuousbeam d.Continuousbeamonly
2. Forasymmetricaltwohingedparabolicarch,ifoneofthesupportssettleshorizontally,then the horizontal thrust
   a)is increased b)isdecreased c)remainsunchangedd)becomeszero
3. TheCastigliano'ssecondtheoremcanbeusedtocomputedeflections
   a. instaticallydeterminate structuresonly b.foranytype ofstructure
   c.atthepointundertheloadonly d.forbeamsandframesonly
4. The elasticstrainenergystored inarectangular cantilever beamoflength Lsubjectedto a bending moment M applied at the end is
   a.$ML^2/2EI$ b.M2L/2E c.$M^2L/3EI$ d.$M^2L/16EI$
5. Incaseofatrussedbeamthestrainenergystoredis dueto
   a.Bendingonly b.directforceonly c.Bothbendinganddirectforce d.none
6. A beamcarriesauniformlydistributed load throughout its length. Inwhichofthe following configurations will strain energy be maximum
   a.Cantilever b.simplysupportedbeam c.Propped cantilever. d.fixedbeam.
7. UnitLoadmethodisbasedon[]
   a)Internalstrainenergy b) Theoremofminimumpotentialenergy
   c)Castigliano'stheorem d)Bettistheorem
8. Strainenergyisaformof[]
   a)kineticenergy b) Heatenergy c)Potentialenergy d)Plasticenergy
9. Arches areofgeometricalshapes of[]
   a)Rectangular b)Square c) Triangular d)Circular
10. Loadswhicharenotconsideredintheanalysisofarchesare[]
    a)Externallyappliedloads b)Supportsettlements
11. DeflectionatmidspanofafixedbeamsubjectedtoUDL[]
    a)5/384*wl4/EI b) 1/384*wl4/EI c)1/192* wl4/EI d)1/84*wl4/EI
12. Castiglianossecond theoremis……..
13. Expressionforstrainenergyduetobendingisgivenby…
14. Eddystheoremstatesthat….
15. TheeconomyofaparticularArch isinfluencedby…….

UNIT– II

1. Thenumberofsimultaneousequationsto besolvedintheslopedeflectionmethod, is equalto
   a) Thedegreeofstatically indeterminacyb)The degreeofkinematicindeterminacy
   c)Thenumberofjointsinthestructured)Noneofthe above
2. Theanalysisofastaticallyindeterminate beamcanbedone by
   a) Equationsofstatic equilibriumaloneb)Equationsofdisplacementordeformations
   c)both a&b d) noneoftheabove
3. A prismatic beam of length L is simply supported at a total u.d.l. of W spread over its entirespan. It isthenproppedatitscentreto neutralizethedeflection. Thenet bending moment at itscentre will be
   a.WL b.WL/8 c.WL/24 d.WL/32
4. Aproppedcantilever ofspan‘L’ issubjectedto amoment +M(sagging) atthepropped end. The moment at the fixed end will be
   a.M(hogging) b. 2M(hogging) c.M/2(hogging) d.none
5. Theratio ofmaximumdeflectionsofa Simplysupportedbeamandfixedbeamcarrying U.d.l.thoughoutis
   a.2 b.3 c.4. d.5
6. Afixed beamofspan4metresissubjected toau.d.l. of30KN/m. Thesupport moment in kN.m
   a.40 b.60 c.30 d.120
7. Thepropreactionofaproppedbeamwithcentralload‘W’is []
   a) 7/8W b)5/8 W c)3/10W d)5/16W
8. Themomentatfixedendinaproppedbeamduetoacouple M0appliedatpropendis[ ]
   a) M0/2b)M0/4 c)M0/6 d)M0/8
9. whenthe left supportofafixed beamrotatesby‘Ɵ’, thefixedend moment atright support is
   a) 2EIƟ/L b)4EIƟ/Lc) 6EIƟ/L d)12EIƟ/L
10. StaticIndeterminacyofaproppedbeamis….
11. Thepropreactionofaproppedbeamcarryingudl‘w’is……
12. ThestaticindeterminacyofaFixedbeamwithverticalloading onlyis…..
13. A beamrestrained frombothrotationand translationatoneand freeattheother supportis called ….
14. For whichoneofthe following cases istheMuller-Breslau principleapplicabletoget influence line?
    (a) Reactionattheendsofasimplebeam
    (b) Bendingmomentatasection
    (c) Shearforceatasection
    (d) Forcesandmomentsatanysection

15. Inanaxiallyloadedspirallyreinforcedshort column, theconcreteinsidethecoreis subjected to

a.bendingandcompressionb. biaxialcompression

c.triaxialcompressiond.uniaxialcompression

UNIT– III

1. Thenumberofmembersrequired forperfectframe_____

   (a)m=2-3j(b)m= 3j-1(c)m= 2j-3(d)m= 2i+1
2. Whatareequationsofequilibrium?

   (a) Summationofallthemoments(b)momentsinXdirection

   (c) MomentsinYdirection (d)momentsinZdirection.
3. Numberofunknowninternalforcesineach memberofarigidjointedplaneframeis

   a)1 b)2 c)3 d)6
4. Arigid-jointedplaneframeisstableandstaticallydeterminateif

   a)(m+r)=2jb)(m+r)=3j

   c)(3m+r)=3jd)(m+3r)=3j
5. Ifinarigid-jointed spaceframe,(6m+r) <6j,thentheframeis

   a)Unstable b)stableandstaticallydeterminate

   c)Stableand staticallyindeterminatee) noneoftheabove
6. .Ifthereare munknownmember forces, r unknownreactioncomponentsand jnumber of joints, then the degree ofstatic indeterminacy ofa pin-jointed plane frame is given by

   a)m+r+2jb)m-r+2jc)m+r-2jd)m+r-3j
7. Apin-jointedplaneframeisunstableif

   a)(m+r)<2jb)m+r=2jc)(m+r)>2jd)(m+r)>2j
8. Trussmemberareconnectedatjointsby[ ]

   a)Boltsb)Linksc)Rollersd)Springs
9. Aforceinamemberofatrusscanbea[]

   a)Momentb)Tensionc)Sheard)Twistingmoment
10. Atrusscanbeunstableevenwhen itis……
11. Thedegree ofindeterminacyofatruss isgivenbytheexpression…..
12. Whichofthe followingtermsrepresentsthetorquecorrespondingto atwist ofoneradian in a shaft over its unit length?

    (a) Torsionalstress(b)Torsionalrigidity

    (c)Flexuralrigidity(d) Momentofresistance
13. A rectangular beam ofwidth 100 mm is subjected to a maximum shear forceof60 kN. Thecorresponding maximumshearstress inthecross-sectionis4N/mm^2. Thedepthof the beam should be

    (a)200mm(b)150mm(c)100mm(d)225mm

14. Out of the two beams of the same material and same cross-sectional area, one is of circular cross-sectionand the other isofsquare cross-section. Ifeachofthese issubjected to bending moment of the same magnitude, then
    (a) bothsectionswouldbeequallystrong.
    (b) bothsectionswouldbeequallyeconomical
    (c) squaresectionwouldbemoreeconomicalthancircularsection
    (d) squaresectionwouldbelesseconomicalthancircular section
15. Forthedesignofacastironmember,themostappropriatetheoryoffailureis
    (a) Mohr'stheory (b)Rankine'stheory
    (c)maximumstress theory (d) maximumshearenergytheory

UNIT– IV

1. Theslopedeflectionsequationsgivetherelationshipbetween
    a. slopeanddeflectiononlyb.Bendingmomentandrotationonly
    c.B.M.andverticaldeflectiononlyd. Bendingmomentrotationand deflections
2. Inslopedeflectionmethodthedisplacementsconsideredare dueto
    a.shearforceb.Bendingmomentc.Axialforceandbendingmoment
    d.Shearforceandbendingmoment
3. Theno.Ofsimultaneousequationstobesolvedintheslopedeflectionmethodisequalto
    a. staticindeterminacy b.Kinematicindeterminacy
    c. No.ofjointdisplacementsinthe structure d.Noneoftheabove.
4. Theratio ofstiffnessofabeamat ajointswithonesidehinged support and other side fixed is (Assuming both beams have same I and L)
    a.1/2 b.3/4 c.1 d.4/3
5. Thereactionatthemiddlesupportis
    a.WL b.5wL/2 c.5wL/4 d.5wL/8
6. Thebendingmomentatthemiddlesupportis
    a.$Wl^2/4$b. $Wl^2/8$ c.$Wl^2/12$ d. $Wl^2/16$
7. Momentdistributionmethodisproposedby[ ]
    A) Hardycross B)Muller C)Hooke D)None
8. Themethodusedforanalysisofindeterminatebeamsandrigidlyjointedframes[ ]
    A)Momentareamethod B)Shearforce C)Slopedeflection method D)None
9. Inslopedeflectionmethod,thedeformationsareconsideredtobecausedby[]
    A)BM B)Shearforce C)Axialforce D)All
10. Theslopedeflectionequationsgivetherelationship between[ ]
    A)SlopeanddeflectiononlyB)BMandrotationonly
    C)BMandShearforceD)BM, rotationand deflection
11. Thenumberofsimultaneousequationstobesolvedinslopedeflectionmethodisequalto
    A)Staticindeterminacy B)Kinematicindeterminacy C)Both D)None

12. Thethreemomentsequationisapplicableonlywhen
    a. thebeamis prismatic b.thereisnosettlement ofsupports
    c.thereisnodiscontinuitysuchashingeswithinthespand.thespansareequal

13. Thenumberofindependent displacement componentsat eachjointofarigid-jointed

space frame is
    b.2 c.3 d.6

14. TheMuller-Breslauprincipleinstructuralanalysisisusedfor
    (a) drawinginfluencelinediagramforanyforcefunction
    (b) superimpositionofloadeffects
    (c) writingvirtualworkequation(d)Noneofthe above

15. Ifashaft rotatesat 100r.p.m. and issubjectedtoatorqueof3000N-m, thepower transmitted in kW would be
    (a) 30∠(b) 15∠(c)20∠(d)10∠

UNIT-V

1. Whatis/aretheuse(s)ofinfluencelines?
    a. tostudytheeffectofmovingloadsonthestructure
    b. Tocalculatethevalueofstressfunctionwiththe criticalload condition
    c. Tofindthepositionofliveloadfor amaximumvalueofparticularstressfunction
    d. Towardsalltheabovepurpose
2. Which one of the following is correct in respect of the influence line for the bending moment at one fourths ofthe span fromleft supportofa prismatic beamsimplysupportedat ends?
    a. Itiscomposedofstraightlinesonly b.Itiscomposedofcurvedlinesonly
    c.Itiscomposedofstraightandcurvedlinesd. Itisparabolic.
3. Whatistheshapeofinfluenced linediagramforthe maximumB.M inrespect ofasimply supported beam?
    a. Rectangularb.triangularc. parabolicd.circular
4. What isthevariationofinfluenced line forstressfunctioninastaticallydeterminate structure?
    a. Parabolicb.Bilinearc. lineard. UniformlyRectangular.
5. Muller-BreslauPrinciple isapplicabletoget influence line forwhichoneofthe following?
    a. reactionat the endsofsimplebeamb.Bendingmomentatasection
    c. Shearforceata section d.Forceandmomentsatanysection

6. For asimplysupported beamofspan10M, I.L.D isdrawn for B.M.at asection4mfrom the left hand support. The maximum B.M. at the section due to a moving point load of 160KN, is equal to

a. 0kN.mb.960kN.m.c.384kN.m.d.400kN.m

7. Foranyparameter at asectionisadiagramshowingthevariationintheparameter atthat sections a unit load rolls over the span. [ ]

a) BMDb)Influencelinec)Shearforced)None

8. Todrawinfluencelinesforanylinearsystem,principleused[ ]

a)Adward's b)Hoen's c) Muller's d)None

9. Therelative stiffnessofaproppedcantileveroflengthLis[]

a)34*L*b)3/L c)2/3L d)None

10. Causefor sideswayofframeis[ ]

a)Settlementofsupports b)horizontalloading

c)unsymmetricalloading d)alltheabove

11. Ifthe shear forceatthesectionofthebeamunder bending isequalto zero ,thenthe bending moment at the section is [ ]

a)Zero b)Max c)Minimum d)None

12. Whichofthefollowingis/aredeterminedatapointofagivenbeamby moment areamethod?

1. Shearforce2.Bending moment3.slope4.deflection Select the correct answer using the codes given below:

a.1 and2b.3alonec.4aloned.3and 4

13. Which one ofthe following rules ascertains the maximumpermissible eccentricity of loads ncircular column so that stresses will always be compressive?

a.Middlefourthruleb. Middlethirdrulec. Middlehalfruled.Middletwo-third rule

14. Inmomentdistributionmethod, thesum of distributionfactors of all themembers meetingat any joint is always

a.zero b.lessthan1 c.1 d.greaterthan1

15. Principle of superpositionisapplicable when deflectionsarelinearfunctions of appliedforces

a. materialobeysHooke'slaw

b. theactionofappliedforceswillbeaffected bysmalldeformations ofthestructure

c. bothaand b d.noneoftheabove

GATEQUESTIONS:

1. Apin-jointedplaneframeisunstableif

a.(m+r)<2j b.m+ r= 2j c.(m+r)>2j d.noneoftheabove

2. Thedegreeofstaticindeterminacyofarigid-jointed spaceframeis

a.m+r-2j b.m+ r-3j c.3m+r-3j d.6m+r-6j

3. Ifthereare munknownmember forces, runknownreactioncomponentsand jnumber joints, then the degree ofstatic indeterminacy ofa pin-jointed plane frame is given by

a.m+r+2j b.m-r+2j c.m+r-2j d.m+r-3j

4. Thenumberofindependent equationsto besatisfied forstaticequilibriuminaspace structure is

b.3 c.4 d.6

5. Ifinarigid-jointed spaceframe,(6m+r)<6j,thentheframeis

a. unstable b. stable and statically determinate c. stable and statically indeterminate d. none of the above

6. Intheslopedeflectionequations,thedeformationsareconsideredto becaused byi) bending moment ii) shear force iii) axialforce The correct answer is

a. only(i) b.(i)and(ii) c.(ii)and(iii) d.(i),(ii)and(iii)

7. Castigliano'sfirsttheoremisapplicablefor staticallydeterminatestructuresonlywhen

a. the system behaves elastically b. principle of superposition is valid c.noneof the aboved. both a and b

8. Numberofunknowninternalforcesineachmemberofarigidjointedplaneframeis a. 1b.2 c.3 d.6

9. Arigid-jointedplaneframeisstableandstaticallydeterminateif

a.(m+r)=2j b.(m+r)=3j c.(3m+r)=3j d. (m+3r)=3j

10. Thedeflectionat anypointofaperfect framecanbeobtained byapplyingaunitloadat the joint in

a. vertical direction b. horizontaldirection

c.inclineddirection d.directioninwhichthedeflectionisrequired

11. Ifinapin-jointed planeframe(m+r) >2j,thentheframeis

a. stableandstaticallydeterminate b.stableandstaticallyindeterminate

c.unstable d.noneoftheabove

12. Independentdisplacementcomponentsateachjointofarigid-jointedplane frameare

a.threelinearmovements b.twolinearmovementsandonerotation

c.onelinearmovementandtworotations d.threerotations

13. Thedegreeofstaticindeterminacyofapin-jointedspaceframeisgiven by

a.m+r-2j b.m+ r-3j c.3m+r-3j d.m+r+3j

14. Incolumnanalogymethod,thearea ofananalogouscolumn for a fixed beamofspan L and flexural rigidity El is taken as

a.L/EI b.L/2EI c.L/3EI d.L/4EI

15. Degreeofkinematicindeterminacyofapin-jointed planeframeisgivenby

a.2j–r b.j-2r c.3j–r d.2j+r

16. Thecarryoverfactorinaprismaticmemberwhosefarendisfixedis

a.0 b.½ c.¾ d.1

17. Thedegreeofkinematicindeterminacyofapin-jointed spaceframeis

a.2j-r b.3j-r c.j-2r d.j-3r

18. Thedegreeofstaticindeterminacyuptowhichcolumnanalogymethodcanbeusedis

a.2 b.3 c.4 d. unrestricted

19. Degreeofstatic indeterminacyofarigid-jointedplane frame having15 members, 3 reaction components and 14 joints is

a.2 b.3 c.6 d.8

20. The principle ofvirtualwork canbeapplied to elasticsystembyconsidering the virtual workof

a. internalforcesonly b. externalforcesonly
c.internalaswellasexternal forces d.noneoftheabove

IESQUESTIONS:

1)Considerthefollowingparameterswithregardstoslendernessratioofacompression member:
1).Material2).Sectionalconfiguration
3).Lengthofmember 4).Supportendconditions

2. Onwhichofthese parametersdoestheslendernessratioofacompression memberdepend?
(a)1,2and3only(b)1,3 and4only(c)2,3 and4only(d)1,2,3and 4

3. Two equalangles,eachbeingISA100mm×100mmofthickness 10mm,are placed back-to-backandconnected to either sideofagusset platethroughasinglerowof16 mm diameterrivets indoubleshear. Theeffectiveareas oftheconnectedandunconnected legs ofeachofthese angles are 775mm^2 and 950 mm^2 respectively. Ifthese angles are not tack-riveted,theneteffectiveareaofthispairofanglesis
(a)3650mm^2(b)3450mm^2(c)3076mm^2(d)2899mm

4. A bar AB of diameter 40 mm and 4 m long is rigidly fixed at its ends. A torque 600 N-m is applied at a sectionofthe bar, 1 mfromend A. The fixing couples TAand TB at the supports A and B, respectively are
(a) 200N-mand400N-m(b)300N-mand150N-m
(c)450N-mand150N-m(d)300N-mand100N-m

5. Considerthefollowingstatementsforlongitudinalreinforcement inaRC membertoresist earthquake force:

1. Thetensionsteelratio onanysectionshallnotbelessthan yckff0.24
2. Thereshallbe twobarsattopaswellasbottomofthememberthroughout.
3. The‘positive’steelat ajoint face must beat least equalto halfthe‘negative’steelat that face.

Whichofthesestatementsarecorrect?

(a) 1and2only(b)1and3only(c)2and3only(d)1,2and3

6. Themaximumnumberofunknownforcesthat canbedetermined inaconcurrent coplanar force system under equilibrium is

(a)2(b)3(c)6(d)1

7. Themaximumbending moment underaparticular point loadamongatrainofpoint loads crossing a simply supported girder occurs when that load is

(a)at mid-spam (b) atone-thirdspan (c) at one-quarterspan

(d) so placed that the load pointand the point ofCG ofthe train of loads are equidistant from the mid-span

8. uniformly distributed load of length 8 m crosses a simply supported girder of span 20 m. The maximum bending moment at the left quarter-span point occurs when the distance between the point of CG of the total load and mid-span is

(a)0(b)2m(c)3m(d)4m

9. Considerthefollowingstatements:

1. Theprincipleofsuperpositionwill hold goodfortheanalysisoflinear structural systems only
2. Thestress inastructuralmember dueto severalapplied forces isthesumoftheeffects due to eachofsuch forces, applied one at atime, only ifthe Hooke’s law hold good.
3. Internalstresses maynot becausedresulting fromlackoffit ofastructuralmember.

Which of these statements are correct?

(a)1,2and 3(b)1and 2only(c)2 and3 only(d)1and 3only

10. Considerthefollowingstatements:

1. Aproperlyconstrainedrigidsystemhasseveraldegreesoffreedom.
2. Thenumber ofdegreesoffreedomofa locomotive moving onarailwaytrack isonly two.
3. Afloatingshiphassixdegreesoffreedom.

Which of these statements is/are correct?

(a)1,2and3(b)3only(c)2only(d)1only

11. suspensionbridgewithatwo-hingedstiffeninggirderisstatically

(a) determinate (b)indeterminateto1degree

(c)indeterminateto2degrees (d)indeterminateto3degrees

XIII. WEBSITES:

a. http://www.asce.org
b. http://www.icivilengineer.com
c. http://www.construction-guide.in

XIV. EXPERTDETAILS:

a. Prof. SATISHC. SHARMADepartmentofMechanical&IndustrialEngineeringIndian Institute of Technology Roorkee
b. Prof. M.S.Sivakumar DepartmentofAppliedMechanics, IITMadras. email: mssiva@iitm.ac.in
c. Prof.S.K. Bhattacharyya,DepartmentofCivilEngineering, IITKharagpur.
d. Dr.SatishCSharma(IITR)
e. LS Ramachandra&SKBarai(IITKGP)

XV. JOURNALS:

0970-1141	ThesisDigestoncivilEngineering	1987
0973-8061	InternationalEngineeringandTechnologyJournalofCivil andStructure	2007
0975-5314	Internationaljournalofcivilengineering	2009
0975-6744	Journalofinformationknowledgeandresearch in civil engineering	2009
0976-6308	Internationaljournalofcivilengineeringandtechnology	2010
2249-426X	InternationalJournalofCivilEngineeringandApplications	2011
2249-8753	RecentTrendsinCivilEngineeringand Technology	2011
2277-5986	WorldResearchJournalofCivilEngineering	2011
2277-7032	InternationalJournalofStructuralandCivilEngineering	2012
2278-9987	InternationalJournalofCivilEngineering(IJCE)	2012
2319-6009	InternationalJournalofStructuralandCivilEngineering Research	2012
2320-723X	InternationalJournalofAdvancedResearchinCivil, Structural,EnvironmentalandInfrastructureEngineering and Developing	2013

XVI. LISTOFTOPICS FOR STUDENTSEMINARS:

a. AnalysisofArches–ThreeHingedandTwoHingedArches
b. Analysisofindeterminatestructuresusingfollowingmethods
c. SlopeDeflectionMethod
d. MomentDistributionMethod
e. FindingDeflectionsusingEnergyTheorems
f. SimpleBeams
g. Pin-jointedTrusses

XVII. CASESTUDIES /SMALLPROJECTS:

a. CasestudyonAnalysisofArches–Three Hingedand TwoHingedArches
b. CasestudyonAnalysisofindeterminate structuresusingfollowingmethods
c. SlopeDeflectionMethod
d. MomentDistributionMethod
e. CasestudyonFinding Deflectionsusing EnergyTheorems
f. SimpleBeams
g. Pin-jointedTrusses
h. CasestudyonAnalysisofstructuresunderMovingLoadswiththehelpofInfluenceLines
i. CasestudyonIndeterminateStructuralAnalysisofTrussusing Castigliano'stheorem