Matrix Methods in Structural Analysis (GR20D5001)

I-M.Tech (Structural engineering) – I Semester (2021-22)

Dr. G.V.V. Satyanarayana

Professor

Department of Civil Engineering

Gokaraju Rangaraju Institute of Engineering and Technology,

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Gokaraju Rangaraju Institute of Engineering andTechnology

Department of Civil Engineering

MATRIX METHODS OF STRUCTURAL ANALYSIS(GR20D5001)

COURSE FILE CHECK LIST

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GR 20 Regulations **M.Tech I Year I semester**

MATRIX METHODS IN STRUCTURAL ANALYSIS (GR20D5001)

UNIT - I

Introduction to matrix methods of analysis - Static indeterminacy and kinematic indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and tensional element. Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates

UNIT - II

Stiffness Matrix Assembly of Structures and its Applications to Simple Problems: Direct Stiffness method, Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations.

UNIT - III

Analysis of Beams, Plane Trusses, Plane Rigid Jointed frames using flexibility method

UNIT - IV

Analysis of plane truss - continuous beam - plane frame and grids by stiffness matrix methods.

UNIT - V

Special analysis procedures - Static condensation and sub structuring - initial and thermal stresses. Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

TEXT BOOKS:

1 . William Weaver J.R and James M.Geve, Matrix Analysis of Frames structures, CBS publications, Delhi 2004.
2. Ashok.K.Jain, Advanced Structural Analysis, New Channel Brothers, 1996.
3. C.S.Reddy, Structural Analysis, 3rd edition, 2010.

REFERENCES:

1. Kanchi, Matrix Structural Analysis, 1995.
2. J.Meek, Matrix Methods of Structural Analysis, 3rd edition, 1980.
3. Ghali and Neyveli, Structural Analysis, 3rd edition , December, 1990.

Gokaraju Rangaraju Institute of Engineering & Technology (Autonomous)

Name of the college & Code : Gokaraju Rangaraju Institute of Engineering & Technology, 24
Name of the PG Program : Master of Technology
Room No: 4203
Specialization : Structural Engineering
Academic Year & Semester : 2021-22, I Semester

Time Table

w.e.f:15-11-2021

DAY/TIME	9:00AM-10:00AM	10.00 AM-11.00 AM	11.00 AM-12.00 PM	12.00 PM-1:00 PM	1.00 PM - 2.00 PM	2.00 PM - 3.00 PM	3.00 PM-4.00 PM
MON							
TUE					MMSA		
WED		MMSA					
THU							
FRI	MMSA						
SAT							

S.No.	Subject Code	Name of the Subject	Name of the Teacher
1	GR18D5164	Matrix Methods in Structural Analysis(MMSA) (Professional Core I)	Dr. G V V Satyanarayana
2	GR18D5165	Advanced Solid Mechanics (Professional Core II)	
3	GR18D5166	Advanced Concrete Technology (Professional Elective-I)	Dr. K.Sriknath
4	GR18D5169	Analytical and Numerical Methods for Structural Engineering (Program Elective II)	Mr.V.Naresh Kumar Varma
5	GR18D5012	Research Methodology and IPR (Core)	Dr.Mohammed Hussain
6	GR18D5207	English for Research Paper Writing (Audit Course 1)	
7	GR18D5172	Structural Design Lab	Dr.Atulkumar Manchalwa
8	GR18D5173	Concrete Technology Lab	Dr.V.S.reddy?Y.Kamal; Raju

M.Tech Coordinator **HOD**

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

Name of the Program: M.Tech (Structural Engineering) **Year: I**

Course/Subject: **Finite Element Methods in Structural Engineering**

Course Code:GR20D5001

Program Educational Objective's

PEO 1:

Graduates of the program will equip with professional expertise on the theories, process, methods and techniques for building high-quality structures in a cost-effective manner**.**

PEO 2:

Graduates of the program will be able to design structural components using contempory software and professional tools with quality practices of international standards.

PEO 3:

Graduates of the program will be effective as both an individual contributor and a member of a development team with professional, ethical and social responsibilities.

PEO 4:

Graduates of the program will grow professionally through continuing education, training, research, and adapting to the rapidly changing technological trends globally in structural engineering.

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Name of the Program: M.Tech (Structural Engineering) **Year: I**

Course/Subject: **Finite Element Methods in Structural Engineering**

Course Code:GR20D5001

Program Outcomes(PO's):

PO 1: An ability to independently carry out research /investigation and development to solve practical problems.

PO 2: An ability to write and present a substantial technical report/document.

PO 3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelors.

PO 4: Possess critical thinking skills and solve core, complex and multidisciplinary structural engineering problems.

PO 5: Assess the impact of professional engineering solutions in an environmental context along with societal, health, safety, legal, ethical and cultural issues and the need for sustainable development.

PO 6: Recognize the need for life-long learning to improve knowledge and competence.

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COURSE OBJECTIVES

Academic **Y**ear : 2021-22

Semester: I

Name of the Program: M.Tech (Structural Engineering) Year: I

Course/Subject: Matrix Methods in Structural Analysis Course Code: **GR20D5001**

Name of the Faculty: Dr.GVVSatyanarayana Dept.:Civil Engineering

Designation: PROFESSOR

On completion of this Subject/Course the student shall be able to:

S.No	Objectives
1	To learn how to idealize statically and kinematically determinate and indeterminate Structures and their ill effects.
2.	To learn the difference between local and global co-ordinates systems and its role in preparation of stiffness matrix.
3	To understand the effective usage of flexibility matrix method in statically indeterminate structures.
4	To understand the effective usage of stiffness matrix method in kinematically indeterminate structures.
5	To understand about static condensation and sub structuring. To learn about shear walls and their role in multi storied structures.

Signature of HOD Signature of faculty

Date: Date:

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the objectives.

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COURSE OUTCOMES

Academic **Y**ear : 2021-22

Semester: I

Name of the Program: M.Tech(Structural Engineering) Year: I

Course/Subject: Matrix Methods in Structural AnalysisCourse Code:**GR20D5001**

Name of the Faculty: Dr.GVVSatyanarayanaDept.:Civil Engineering

Designation: PROFESSOR.

The expected outcomes of the Course/Subject are:

S.No	Outcomes
1	Evaluate the static and kinematic indeterminacy and generate stiffness and flexibility matrices.
2	Analyse the skeleton structures using stiffness method under different coordinate system.
3	Use flexibility matrix method to analyse different structures.
4	Use stiffness matrix method to analyse different structures.
5	Analyse various types of structural members using special analysis procedures and shear walls in multi storied constructions

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Date: Date:

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the outcomes.

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M.Tech (Structural Engineering)
I Year I Semester

Academic Year 2021-22

S.No	Student Name	Roll No
1	ATKAPURAM PRASHANTH	21241D2001
2	BANDI SRI RAM GOPAL	21241D2002
3	CHALLA MADHAVI	21241D2003
4	PAMMI DIVYA	21241D2004
5	DUMMA UMESH KUMAR	21241D2005
6	K LATHASREE	21241D2006
7	MARIYALA VAISHNAVI	21241D2007
8	MAVOORI PRANAV	21241D2008
9	MITTAPALLI NAGA ASHWINI	21241D2009
10	RAVULA VENKATA SURAJ REDDY	21241D2010
11	REPATI MOHAN BABU	21241D2011
12	CHERUKU SANDHYA	21241D2012
13	SHAIK FEROZ	21241D2013
14	S K SAI CHANDRA	21241D2014
15	THOTA HARSHAVARDHAN	21241D2015
16	VARIKUPPULA LALITHA	21241D2016
17	YAMBA RAMA GNANENDRA SAI	21241D2017
18	YENUMALA DEVESH GOUD	21241D2018
19	S PRASHANTH KUMAR	21241D2019
20	BAVANDLAPELLI THARUNTEJA	21241D2020
21	G NITISH KUMAR	21241D2021

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GUIDELINES TO STUDY THE COURSE/SUBJECT

Academic **Y**ear : 2021-22

Semester : I

Name of the Program: M.Tech(Structural Engineering) Year: I

Course/Subject: Matrix Methods in Structural Analysis Course Code: **GR20D5001**

Name of the Faculty: Dr.GVVSatyanarayana Dept.: Civil Engineering

Designation: PROFESSOR

Guidelines to study the Course/ Subject: Structural Analysis

Course Design and Delivery System (CDD):

- The Course syllabus is written into number of learning objectives and outcomes.
- These learning objectives and outcomes will be achieved through lectures, assessments, assignments, experiments in the laboratory, projects, seminars, presentations, etc.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

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COURSE SCHEDULE

Academic **Y**ear : 202122

Semester : I

Name of the Program: M.Tech (Structural Engineering) Year: I

Course/Subject:Matrix Methods in Structural analysis Course Code: **GR20D5001**

Name of the Faculty: Dr.GVVSatyanarayana Dept.: Civil Engineering

Designation: PROFESSOR

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. Of Periods
		From	To	
1.	Unit – I Introduction to Matrix methods of Analysis	16-11-21	07-12-21	13
2.	Unit- II Assembly of stiffness matrices	08-12-21	24-12-21	10
3.	Unit-III Introduction about Flexibility matrix method(Force Method) And application to indeterminate beams	24-12-21	25-01-22	12
4.	Unit-IV Introduction about stiffness matrix method(Displacement Method) And application to indeterminate beams	28-01-22	11-02-22	10
5.	Unit-V Special analysis proceduresIntroduction about special analysis procedures, static condensation and sub structuring in structures	15-02-22	01-03-22	09

Total No. of Instructional periods available for the course: 54Hours / Periods

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SCHEDULE OF INSTRUCTIONS
COURSEPLAN

Academic **Y**ear : 2021-22

Semester : I UNIT NO.: I TO V

Name of the Program : M.Tech Year: I

Course/Subject: **Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty: Dr.GVV Satyanarayana Dept.: Civil Engineering

Designation: PROFESSOR

UNIT - I

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Text Book, Journal…) Page Nos.: ____to ____
1.	1.	16-11-2021	1	**Unit – I Introduction to Matrix methods of Analysis -** Introductionabout Matrix Methods in Structural analysis	1 & 1	Structural Analysis by S.S.Bhavikati , Advanced Structural Analysis by Asohk.K.Jainn and Structural analysis by C.S.Reddy
	2.	17-11-2021	1	Determination of Static indeterminacy of structures	1 & 1	
	3.	19-11-2021	1	Determination of Kinematic indeterminacy of structures	1 & 1	
	4.	19-11-2021	1	Determination of DOF of given structures	1 & 1	
	5.	23-11-2021	1	Explain the co-ordinate system	1 & 1	
	6.	24-11-2021	1	Structure idealization	1 & 1	
	7.	26-11-2021	1	Differentiate & relation between Stiffness & Flexibility Matrix methods	1 & 1	
		26-11-	1	Explain general	1 & 1	

	8.	2021		equations for Flexibility & stiffness matrix methods		
	9	13-11-2021	1	Derivation of displacement equations for truss element	1 & 1	
	10	01-12-2021	1	Derivation of displacement equations for beam elements	1 & 1	
	11	03-12-2021		Derivation of displacement equations of tensional elements	1 & 1	
	12	03-12-2021		Discuss on element stiffness matrix	1 & 1	
	13	07-12-2021		Discuss on local and Global coordinates	1 & 1	

UNIT - II

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Text Book, Journal…)
2.	1.	08-12-2021	1	**Unit- IIStiffness Matrix Assembly of Structures** and its	2 & 2	Structural Analysis by S.S.Bhavikati , Advanced Structural Analysis by Asohk.K.Jainn and Structural analysis by C.S.Reddy
	2.	10-12-2021	1	Local matrix and global matrix for load and displacement vectors (Stiffness matrix in global coordinates)	2 & 2	
	3.	10-12-2021	1	stiffness matrix approach and Applications to Simple Problems method	2 & 2	
	4.	14-12-2021	1	Evaluation of stiffness matrix using Direct Stiffness method	2 & 2	
	5.	15-12-2021	1	General procedure of assembly of stiffness matrices	2 & 2	
	6.	17-12-2021	1	Discuss on boundary conditions	2 & 2	
	7.	17-12-2021	1	Solutions of stiffness matrix equations	2 & 2	
	8.	21-12-2021	1	Solutions of stiffness matrix equations	2 & 2	
	9.	22-12-2021	1	Assembling global stiffness matrices	2 & 2	

	10.	24-12-2021	**1**	Spring problems	2 & 2	

UNIT - III

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Text Book, Journal…)
3.	1.	24-12-2021	1	**Unit-III** Introduction about Flexibility matrix method(Force Method) And application to indeterminate beams	3 & 3	Structural Analysis by S.S.Bhavikati , Advanced Structural Analysis by Asohk.K.Jainn and Structural analysis by C.S.Reddy
	2.	28-12-2021	1	Flexibility matrix approach to statically indeterminate beams	3 & 3	
	3.	29-12-2021	1	Methodology to calculate redundant forces at beam joints using flexibility matrix method	3 & 3	
	4.	31-12-2021	1	Methodology to calculate redundant forces at beam joints using flexibility matrix method	3 & 3	
	5.	31-12-2021	1	Analyze continuous beams by using flexibility matrix methods carrying with different loads	3 & 3	
	6.	04-01-2022	1	Analyze continuous beams by using flexibility matrix methods carrying with different loads and sinking supports	3 & 3	
	7.	54-01-2022	1	Analyze plane truss by using flexibility matrix methods carrying with different loads	3 & 3	
	8.	07-01-2022	1	Analyze plane truss by using flexibility matrix methods carrying with different loads	3 & 3	
	9.	07-01-2022	1	Analyze plane frame by using flexibility matrix methods carrying with different loads	3 & 3	
	10.	11-01-2022	1	Analyze plane frame by using flexibility matrix methods carrying with different loads	3 & 3	

	11.	12-01-2022	1	Solving old question papers in unit -3	3 & 3	
	12.	25-01-2022	1	Solving old question papers in unit -3	3 & 3	

UNIT - IV

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Text Book, Journal…)
4.	1.	28-01-2022	1	**Unit-IV** Introduction about Flexibility matrix method(Displacement Method) And application to indeterminate beams	4 & 4	Structural Analysis by S.S.Bhavikati , Advanced Structural Analysis by Asohk.K.Jainn and Structural analysis by C.S.Reddy
	2.	28-01-2022	1	Stiffness matrix approach to kinematically indeterminate beams	4 & 4	
	3.	01-02-2022	1	Methodology to calculate redundant forces at beam joints using stiffness matrix method	4 & 4	
	4.	02-02-2022	1	Methodology to calculate redundant forces at beam joints using stiffness matrix method	4 & 4	
	5.	04-02-2022	1	Analyze continuous beams by using stiffness matrix methods carrying with different loads	4 & 4	
	6.	04-02-2022	1	Analyze continuous beams by using stiffness matrix methods carrying with different loads and sinking supports	4 & 4	
	7.	08-02-2022	1	Analyze plane truss by using stiffness matrix methods carrying with different loads	4 & 4	
	8.	09-02-2022	1	Analyze plane truss by using stiffness matrix methods carrying with different loads	4 & 4	
	9.	11-02-2022	1	Analyze plane frame by using stiffness matrix methods carrying with different loads	4 & 4	
	10.	11-02-2022	1	Analyze plane frame by using stiffness matrix	4 & 4	

				methods carrying with different loads		

UNIT - V

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Text Book, Journal…)
5.	1.	15-02-2022	1	**Unit-V** Introduction about Special analysis procedures	5 & 5	Structural Analysis by S.S.Bhavikati , Advanced Structural Analysis by Asohk.K.Jainn and Structural analysis by C.S.Reddy
	2.	16-02-2022	1	Importance about special analysis procedures	5 & 5	
	3.	18-02-2022	1	Explain static condensation with suitable example	5 & 5	
	4.	18-02-2022	1	What is sub-structuring? And its importance in structural analysis	5 & 5	
	5.	22-02-2022	1	What is effect due to initial and thermal stress in structures?	5 & 5	
	6	23-02-2022	1	Introduction and Necessity of shear walls	5 & 5	
	7	25-02-2022	1	Importance of shear walls in structures and their location in structures	5 & 5	
	8	25-02-2022	1	Structural behaviour of large frames with and without shear wall	5 & 5	
	9	01-03-2022	1	Approximate methods of analysis of shear walls	5 & 5	

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 16-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 1 Duration of Lesson: 1hr

Lesson Title: Introduction about Matrix methods of analysis

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Definition of structure and its importance.

2. Analyze the different parameters induced in the structure during loading.

3. Analyze different structures with different end conditions.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Definition of a structure
- Differentiate between link and mechanism
- Different types of structures

Assignment / Questions: (1 & 1) 1. What is a structure?
(1 & 1) 2. Explain link and hinge where they are used.

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Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 17-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 2 Duration of Lesson: 1hr

Lesson Title: Determination of Static indeterminacy of structures

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Definition of static indeterminacy.

2. Basic formulas for various structures come under static indeterminate.

3. Tips in determination of static indeterminacy.

TEACHING AIDS : white board, Different color markers

TEACHING POINTS :

- Definition of static indeterminacy.
- Differentiate between link and hinge in a structure.
- Formula for static indeterminacy for external and internal indeterminacy of various structures.

Assignment / Questions: (1 & 1) 1. What is redundant?

(1 & 1) 2. Explain in determination of static indeterminacy of a structure.

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Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 19-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 3 Duration of Lesson: 1hr

Lesson Title: Determination of Kinematic indeterminacy of structures

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Determination of Kinematic indeterminacy of structures.
2. Degrees of freedom at various supports.
3. Difference between DOF's and redundants.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Definition of kinematic indeterminacy.
- Differentiate between static and kinematic indeterminacy.
- Evaluation of kinematic indeterminacy with different methods.

Assignment / Questions: (1& 1) 1. Explain the procedure in evaluation of kinematic indeterminacy?

(1 & 1) 2.Explain the difference between static and kinematic indeterminate structures.

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Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 19-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 4 Duration of Lesson: 1hr

Lesson Title: Determination of DOF of given structures

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Determine the DOF at different supports.

2. Analyze different structures with different end conditions

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Definition of a cantilever method in determination of KID.
- Differentiate between vertical and horizontal shear release at supports.

Assignment / Questions: (1& 1) 1. What is angular and linear translation at pin and rigid joints?
(1& 1) 2. Explain the cantilever method or tree method to evaluate the KID
of structure..

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Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 23-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 5 Duration of Lesson: 1hr

Lesson Title: Structure idealization

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1.How to idealize the structure under different co-ordinate systems?

2. How to change the local co-ordinates into global co-ordinate system.

3. Importance of transformation matrix.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Definition of transformation matrix.
- How to change local co-ordinates in to global co-ordinates?

Assignment / Questions: (1& 1) 1. What is use of transformation matrix?
(1& 2) 2. Explain the differences between local and global co-ordinate system.

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Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 24-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Differentiate & relation between Stiffness & Flexibility Matrix methods

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand about the structure idealization.
3. Suitability of structure idealization in Structural Analysis.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure of structure idealization.

Assignment / Questions: (1& 1) 1. Explain about the structure idealization.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 26-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 7 Duration of Lesson: 1hr

Lesson Title: Differentiate and relation betweenFlexibility & stiffness matrix methods

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Derive the general relationship between Flexibility & stiffness matrix methods

2. Explain the differences between Flexibility & stiffness matrix methods

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- How to evaluate the general relationship between Flexibility & stiffness matrix methods
- Explain the differences between Flexibility & stiffness matrix methods

Assignment / Questions: (1& 1) 1. Derive the relationship between Flexibility & stiffness matrix
Methods.

(1 & 1) 2. List out the differences between Flexibility & stiffness matrix Methods.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 26-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 8 Duration of Lesson: 1hr

Lesson Title: Explain general equations for Flexibility & stiffness matrix methods

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Derive the general equation for flexibility method.

2. Derive the general equation for stiffness method.

3. Explain the characteristics of stiffness / flexibility matrices

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure in calculation of forces in the pin jointed truss or beam using force method.
- Explain the procedure in calculation of forces in the pin jointed truss or beam using displacement method

Assignment / Questions: (1 & 1) 1. Derive the forces in the pin jointed truss or beam using force method.

(1 & 1) 2. Derive the forces in the pin jointed truss or beam using displacement method.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 13-11-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 9 Duration of Lesson: 1hr

Lesson Title: Derive displacement equations for truss element.

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INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Calculation of displacement equations for truss element.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Evaluate the displacement equations for truss element.

Assignment / Questions: (1& 1) 1. How to calculate the displacement equations for truss element.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 01-12-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 10 Duration of Lesson: 1hr

Lesson Title: Derivation of displacement equations for beam element

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1.Calculation of displacement equations for beam element

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- How to calculate the displacement equations for beam element

Assignment / Questions: (1,2& 2) 1. Evaluate the displacement equations for beam element

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 03-12-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 11 Duration of Lesson: 1hr

Lesson Title: Derivation of displacement equations for tensional element.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Evaluation of displacement equations for tensional element.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the procedure to evaluate displacement equations for tensional element.

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1. Assignment / Questions: (1 & 1) 1. Explain the procedure in determination of displacement equations for tensional element.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 03-12-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 12 Duration of Lesson: 1hr

Lesson Title: Discuss on element stiffness matrix

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1.Explain about element stiffness matrix

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Evaluation of element stiffness matrix using direct method.
- Check the properties of stiffness matrix after evaluation.

Assignment / Questions: (1 & 1) 1. What is element stiffness matrix?
(1& 1) 2. Determine stiffness matrices for different assigned co-ordinates.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 07-12-2021

Semester : I **Unit – I Introduction to Matrix methods of Analysis**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 13 Duration of Lesson: 1hr

Lesson Title: Discuss on local and Global co-ordinates

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand about the local and Global co-ordinates

2. Differences between local and natural co-ordinate systems.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain about Global and natural co-ordinate system and their differences

Assignment / Questions: (1 & 1) 1. Explain different co-ordinate systems with suitable examples.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 08-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 14 Duration of Lesson: 1hr

Lesson Title: Assembly of stiffness matrices.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Calculation of size of stiffness matrix.

2. Evaluate the global stiffness matrix from individual stiffness matrices.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Assembling of global stiffness matrix from individual stiffness matrices.
- Evaluate the size of global stiffness matix.

Assignment / Questions: (2& 2) 1. Evaluate the global stiffness matrices from individual stiffness
matrices

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 10-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 15 Duration of Lesson: 1hr

Lesson Title: Local matrix and global matrix for load and displacement vectors

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Calculation of global displacement vector.
2. Explain the procedure for calculation of global load vector from elemental load vectors.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Evaluate the elemental load and displacement vectors.
- Explain the procedure in preparation of Global load and displacement vectors from individual load and displacement vectors.

Assignment / Questions: (2 & 2) 1. Evaluate the Global load and displacement vectors with help of
individual load and displacement vectors.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 10-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 16 Duration of Lesson: 1hr

Lesson Title: Explain direct stiffness matrix method

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the procedure in determination stiffness matrix coefficients.
2. Understand the properties of stiffness matrix.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- What is stiffness in case rotation and deflection.
- Definition and its role in stiffness matrices.

Assignment / Questions: (2 &2) 1. Discuss the direct stiffness matrix method.
(2 &2) 2. List out the properties stiffness matrix.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 14-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 17 Duration of Lesson: 1hr

Lesson Title: General procedure algorithm for assembly stiffness matrices

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the procedure in assembling of stiffness matrices.
2. Understand the importance of assembling of stiffness matrices.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- The steps involved in assembling of stiffness matrices.

Assignment / Questions: (2 & 2) 1. Derive the global stiffness matrix using assembling of element
stiffness matrices.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 15-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 18 Duration of Lesson: 1hr

Lesson Title: Discuss on boundary conditions.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the basic properties of supports.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the properties of various support conditions and boundary conditions using in analysis of structures.

Assignment / Questions: (2 & 2) 1. List of properties of supports and boundary conditions.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 17-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 19 Duration of Lesson: 1hr

Lesson Title: Solutions of stiffness matrix equations.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand in solving the simultaneous equations formed by stiffness matrix.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure for solving the stiffness matrix equations.

Questions: (2& 2) 1. Solve stiffness matrix co-efficient formed by direct angular transformations.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 17-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 20 Duration of Lesson: 1hr

Lesson Title: Solutions of stiffness matrix equations.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand in solving the simultaneous equations formed by stiffness matrix.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure for solving the stiffness matrix equations.

Assignment / Questions: (2 & 2) 1. Solve stiffness matrix co-efficient formed by direct linear transformations.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 21-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 21 Duration of Lesson: 1hr

Lesson Title: Solving old question paper problems

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Evaluate the statically indeterminate beams by stiffness matrix method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the step wise procedure to analyze a statically indeterminate beam using stiffness matrix method.

Assignment / Questions: (2 & 2) 1. Analyse a statically indeterminate beam by displacement method

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 22-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 22 Duration of Lesson: 1hr

Lesson Title: Solving old question paper problems

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Evaluate the statically indeterminate beams by stiffness matrix method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the step wise procedure to analyze a statically indeterminate beam using stiffness matrix method.

Assignment / Questions:(2 & 2) 1. Analyse a statically indeterminate beam by displacement method

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 24-12-2021

Semester : I **Unit – II Assembly of stiffness matrices**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 23 Duration of Lesson: 1hr

Lesson Title: Solving old question paper problems

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Evaluate the statically indeterminate beams by stiffness matrix method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the step wise procedure to analyze a statically indeterminate beam using stiffness matrix method.

Assignment / Questions: (2 & 2) 1. Analyse a statically indeterminate beam by displacement method

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 24-12-2021

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 24 Duration of Lesson: 1hr

Lesson Title:Introduction about stiffness matrix or displacement method and applications to indeterminate beams

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the procedure to analyze any continuous beam having static indeterminate structure.

2. Calculate the moments at supports using stiffness matrix method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Analyze the continuous beams using stiffness matrix method
- Evaluate the support moments using stiffness matrix method

Assignment / Questions: (3& 3) 1. Evaluate the support momentsfor given loading using displacement
Method.

(3& 3) 2. Draw BMD and SFD for analyzed continuous beams.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 28-12-2021

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 25 Duration of Lesson: 1hr

Lesson Title: Stiffness matrix approach to kinematically in-determinate beams

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Calculate the kinematic indeterminacy (KID)of given beam.
2. Understand in calculation of support moments

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the procedure to evaluate KID of the given structure.
- Evaluate the support reactions and moments in continuous beams subjected various loading using stiffness matrix method.

Assignment / Questions: (3 & 3) 1. Evaluate support reaction of a given continuous beam using displacement method.

(3 & 3) 2. Evaluate the support moments of a continuous beams using displacement method.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 29-12-2021

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 26 Duration of Lesson: 1hr

Lesson Title: Methodology to calculate the redundants forces at beam joints using stiffness matrix
method.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze the KID structure using displacement method.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Analyze the kinematically indeterminate of beams.

Assignment / Questions: (3 & 3) 1. Analyze the kinematically indeterminate structure.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 31-12-2021

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 27 Duration of Lesson: 1hr

Lesson Title: Methodology to calculate the redundants forces at beam joints using stiffness matrix
method.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. 1. Analyze the KID structure using displacement method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Analyze the kinematically indeterminate of beams.

1. Assignment / Questions: (3 & 3) 1. Analyze the kinematically indeterminate structure.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 31-12-2021

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 28 Duration of Lesson: 1hr

Lesson Title: Analyze continuous beams using stiffness matrix method carrying with different loads.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand to analyze continuous beams using stiffness matrix method with kinematic indeterminacy 1,2 or 3.

2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) after analysis.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Evaluation of KID beams.
- Draw BMD and SFD after analysis.

Assignment / Questions: (3&3) 1. Analyze KID beams using displacement method under given loading.

(3& 3) 2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for frame.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 04-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 29 Duration of Lesson: 1hr

Lesson Title: Analyze continuous beams using stiffness matrix method carrying with different loads and
sinking supports

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze continuous beams using stiffness matrix method carrying with different loads and sinking supports

2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) after analysis.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Analyze continuous beams using stiffness matrix method carrying with different loads and sinking supports
- Draw BMD and SFD after analysis.

Assignment / Questions: (3&3) 1. Analyze continuous beams using stiffness matrix method carrying
with different loads and sinking supports
(3 & 3) 2. Draw Bending Moment Diagram (BMD) & Shear force
diagram (SFD) for portal frame after analysis.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 05-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 30 Duration of Lesson: 1hr

Lesson Title: Analyze plane truss by using stiffness matrix methods carrying with different loads

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze the plane truss by using stiffness matrix methods carryingcontinuous beams with different loadings.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Analyze the plane truss carrying with different loadings.
- Draw BMD and SFD after analysis.

Assignment / Questions: (3 & 3) 1. Analyze the plane truss by using stiffness matrix methods carrying
with different loadings.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 07-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 31 Duration of Lesson: 1hr

Lesson Title: Analyze plane truss by using stiffness matrix methods carrying with different loads

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze the plane truss by using stiffness matrix methods carrying continuous beams with different loadings.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Analyze the plane truss carrying with different loadings.
- Draw BMD and SFD after analysis.

Assignment / Questions: (3 & 3) 1. Analyze the plane truss by using stiffness matrix methods carrying
with different loadings.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 32 Duration of Lesson: 1hr

Lesson Title: Analyze plane frame by using stiffness matrix methods carrying with different loads

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze the plane frame by using stiffness matrix methods carrying continuous beams with different loadings.

2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) after analysis.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the process to analyze the plane truss by using stiffness matrix methods carrying continuous beams with different loadings.
- Draw BMD and SFD after analysis.

Assignment / Questions: (3 & 3) 1. Analyze the plane frame by using stiffness matrix methods carrying continuous beams with different loadings.

(3&3) 2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for plane frame after analysis.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 33 Duration of Lesson: 1hr

Lesson Title: Analyze plane frame by using stiffness matrix methods carrying with different loads

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Analyze the plane frame by using stiffness matrix methods carrying continuous beams with different loadings.
2. Evaluation of kinematic indeterminacy or total DOF of structure.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Define stiffness in terms of displacement and rotations.
- Evaluation of kinematic indeterminacy of structure..

Assignment / Questions: (3 & 3) 1. Analyze the plane frame by using stiffness matrix methods carrying continuous beams with different loadings.

(3 & 3) 2. Discuss which method is suitable in analysis of structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 25-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 34 Duration of Lesson: 1hr

Lesson Title: Solve old question paper problems in unit-3

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the analysis of KID structures using displacement method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain old question paper problems in unit-3 using displacement methods.

Assignment / Questions: (3 & 3) 1. Determine the kinematic indeterminacy and applied appropriate
co-ordinates as per dof.
(3 & 3) 2. Analyse the KID structures using displacement method and draw SFD and BMD's.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 28-01-2022

Semester : I **Unit – III Introduction about stiffness matrix method**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 35 Duration of Lesson: 1hr

Lesson Title: Solve old question paper problems in unit-3

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the analysis of KID structures using displacement method.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain old question paper problems in unit-3 using displacement methods.

Assignment / Questions: (3 & 3) 1. Determine the kinematic indeterminacy and applied appropriate co-ordinates as per dof.

(3 & 3) 2. Analyse the KID structures using displacement method and draw SFD and BMD's.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 28-01-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 36 Duration of Lesson: 1hr

Lesson Title: Introduction about special analysis procedures

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the importance and role of special procedure in analysis of structures.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the methodology of special procedures in analysis of structures.

Assignment / Questions: (4&4) 1. State the need of special procedures in analysis of structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 01-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR
Lesson No: 37 Duration of Lesson: 1hr

Lesson Title: Importance about special analysis procedures

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand Importance about special analysis procedures.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the Importance about special analysis procedures.

Assignment / Questions: (4&4) 1. Write a short note on Importance about special analysis procedures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 02-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 38 Duration of Lesson: 1hr

Lesson Title: Static condensation of structures

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand the importance of Static condensation of structures
2. Analyze the given structures using Static condensation procedure.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the term Static condensation of structures
- Explain the procedure in analysis of structures using Static condensation.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :
Assignment / Questions: (4&4) 1. What is static condensation?
(4& 4) 2. Explain Static condensation and its suitability in analysis of structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 04-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 39 Duration of Lesson: 1hr

Lesson Title: Explain Static condensation with suitable example structures

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand the role of Static condensation in analysis of structures

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the Static condensation with suitable example structures

Assignment / Questions: (4 &4) 1.Explain the term static condensation with suitable example.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 04-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 40 Duration of Lesson: 1hr

Lesson Title: What is sub-structuring?

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand the principle of sub-structuring.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure of sub-structuringusing analysis of structures.

Assignment / Questions: (4&4) 1. Explain the sub-structuring procedure in analysis of structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 08-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 41 Duration of Lesson: 1hr

Lesson Title: Importance of sub-structuring in structural analysis

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand about the importance of sub-structuring

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the role of sub-structuringin analysis of structures.

Assignment / Questions: (4 & 4) 1. Explain the role sub-structuring in analysis of structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 09-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 42 Duration of Lesson: 1hr

Lesson Title: What is effect due to initial and thermal stresses in structures?

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the effect due to initial and thermal stresses in structures

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the effects due to initial and thermal stresses in structures

Assignment / Questions: (4& 4) 1. Describe the effects due to initial and thermal stresses in structures

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 43 Duration of Lesson: 1hr

Lesson Title: Solve old question papers in unit-4

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

- Analyse the continuous beams using static condensation.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the procedure in analysis of Continuous beams using static condensation.

- Assignment / Questions: (4& 4) 1. Analyze Continuous beams using static condensation.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 44 Duration of Lesson: 1hr

Lesson Title: Solve old question papers in unit-4

.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the ill effects in analysis of structures when initial and thermal stresses induced in structures.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the ill effects of thermal and initial stresses induced in the structures.

Assignment / Questions: (4& 4) 1. Explain the ill effects of thermal and initial stresses induced in the structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 15-02-2022

Semester : I **Unit – IV Introduction about special analysis procedures**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 45 Duration of Lesson: 1hr

Lesson Title: Solve old question papers in unit-4

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INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the procedure in sub structuring to analyze large structures.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain the procedure in sub structuring to analyze large structures.

Assignment / Questions: (4& 4) 1.Explain the procedure in sub structuring to analyze large structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 18-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 46 Duration of Lesson: 1hr

Lesson Title: –Introduction about shear walls.

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand the definition of shear walls.

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain about shear walls.

Assignment / Questions: (5 & 5) 1.Discus about definition of shear walls.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

LESSON PLAN

Academic **Y**ear : 2021-22 Date: 18-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 47 Duration of Lesson: 1hr

Lesson Title: Necessity of shear walls in structures and their shapes

.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Know about importance of shear walls in building constructions.
- Understand the shapes of shear walls and their role in building constructions.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain about importance of shear walls in building constructions.
- Explain various shapes of shear walls used in structures.

Assignment / Questions: (5 & 5) 1.Discuss on various shapes of shear walls used in structures.

- (5 & 5) 2. Discuss on importance of shear walls in building constructions.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 22-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 48 Duration of Lesson: 1hr

Lesson Title: Importance of shear walls in structures and their location in structures.

STRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

- Know about the locations of shear walls and role of shear walls against earthquake or lateral loads acting on structures.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain about the locations of shear walls and role of shear walls against earthquake or lateral loads acting on structures.

Assignment / Questions: (5 & 5) 1. Write about the locations of shear walls and role of shear walls
against earthquake or lateral loads acting on structures.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 23-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 49 Duration of Lesson: 1hr

Lesson Title: Structural behaviour of large frames with and without shear walls

INSTRUCTIONAL/LESSON OBJECTIVES:
On completion of this lesson the student shall be able to:

1. Understand the behaviour large frames with and without shear walls

TEACHING AIDS : white board, Different colour markers
TEACHING POINTS :

- Explain the behaviour of large frames with and without shear walls.

Assignment / Questions: (5 & 5) 1.Narrate the behaviour of large frames with and without shear walls.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 25-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 50 Duration of Lesson: 1hr

Lesson Title: Structural behaviour of large frames with and without shear walls

.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand the behavior large frames with and without shear walls

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

• Explain the behaviour of large frames with and without shear walls.	• Explain various approximate methods of analysis for shear walls.

Assignment / Questions: (5 & 5) 1.Narrate the behaviour of large frames with and without shear walls.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 25-02-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 51 Duration of Lesson: 1hr

Lesson Title:Approximate methods of analysis for shear walls

.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

1. Understand in methods of analysis against shear walls.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain various approximate methods of analysis for shear walls.

Assignment / Questions: (5 & 5) 1.Discuss on various approximate methods of analysis for shear walls.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 01-03-2022

Semester : I **Unit – IV V Shear walls**

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject :**Matrix Methods in Structural Analysis** Course Code: **GR20D5001**

Name of the Faculty : Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation: PROFESSOR

Lesson No: 52 Duration of Lesson: 1hr

Lesson Title: Approximate methods of analysis for shear walls

.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:

2. Understand in methods of analysis against shear walls.

TEACHING AIDS : white board, Different colour markers

TEACHING POINTS :

- Explain various approximate methods of analysis for shear walls.

Assignment / Questions: (5 & 5) 1.Discuss on various approximate methods of analysis for shear walls.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

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EVALUATION STRATEGY

Academic **Y**ear : 2021-22

Semester : I

Name of the Program: M.Tech (Structural Engineering) Year: I

Course/Subject: **Matrix Methods in Structural analysis** Subject Code(**GR20D5001**

Name of the Faculty: GVV Satyanarayana Dept.: Civil Engineering

Designation : PROFESSOR

1. TARGET:

A) Percentage for pass: 98%

b) Percentage of class: 1st class with distinction - 60%
1st class - 40%

2. COURSE PLAN& CONTENT DELIVERY

(Please write how you intend to cover the contents: i.e., coverage of Units/Lessons by lectures, design, exercises, solvingnumericalproblems, demonstrationofmodels,modelpreparation, experiments in the Lab., orbyassignments,etc.)

3. METHOD OF EVALUATION

3.1 ☐ Continuous Assessment Examinations (CAE-I, CAE-II)

3.2 ☐ Assignments/Seminars

3.3 ☐ Project Review/ Comprehensive viva-voce

3.4 ☐ Quiz

3.5 ☐ Semester/End Examination

3.6 ☐ Others

4. List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this Semester.

……..

Signature of HOD Signature of faculty

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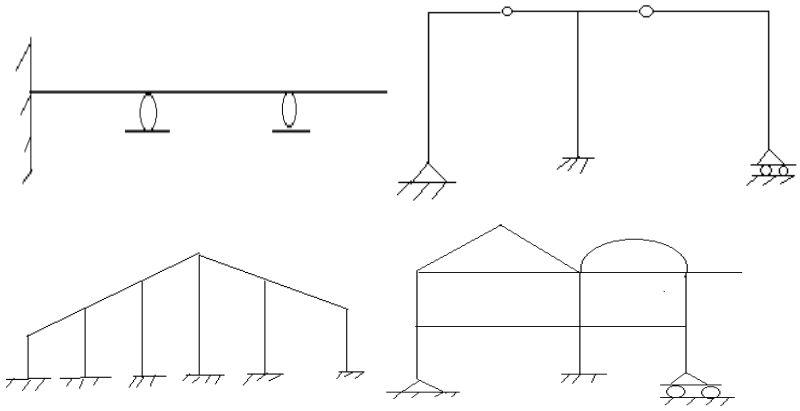
TUTORIAL SHEET - 1

Academic **Y**ear	: 2021-22	Date: 07-12-2021
Semester : I		
Name of the Program	:M.Tech (Structural Engineering)	Year: I
Course/Subject	: Matrix methods in Structural Analysis	
Name of the Faculty	:Dr.GVV Satyanarayana.	Dept.: Civil Engineering

This Tutorial corresponds to Unit No. 1/ Lesson**Introduction to Matrix methods of Analysis (GR20D5001)**

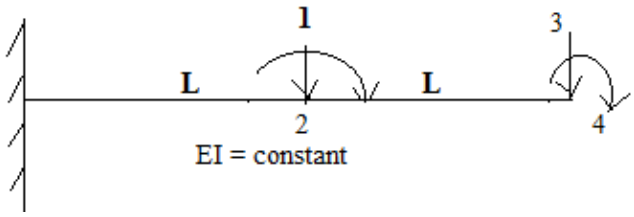
Q1. What is static and kinematic indeterminacies? Explain both indeterminacies with suitable examples.

Q2. Evaluate the static and kinematic indeterminacies of shown structures.



Q3.What is structural idealization and explain with neat figure.

Q4. Differentiate the flexibility matrix for the given co-ordinates.



Q4. Derive the relationship between stiffness and flexibility matrices.

Q5. Derive displacement equations for beam and truss elements.

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.: 1,1

Outcome Nos.: 1,1

Signature of HOD Signature of faculty

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

TUTORIAL SHEET - 2

Academic **Y**ear : 2021-22 Date: 24-12-2021
Semester : I
Name of the Program : M.Tech(Structural Engineering) Year: I

Course/Subject : **Matrix methods in Structural Analysis(GR20D5001)**
Name of the Faculty :Dr.GVVSatyanarayana Dept.: Civil Engineering
Designation : PROFESSOR

This Tutorial corresponds to Unit No. 2/ Lesson**Assembly of stiffness matrices**

Q1.Explain the procedure in assembling stiffness.
Q2.Write about transformation matrix and explain the terms local and global co-ordinates.
Q3.Explain direct stiffness method
Q4Discuss on boundary conditions
Q5Solutions of stiffness matrix equations
Q6. Write a computer algorithm to Analyse any structure with suitable example.

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.: 2
Outcome Nos.: 2,

Signature of HOD Signature of faculty

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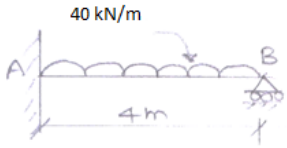
TUTORIAL SHEET - 3

Academic **Y**ear : 2021-22 Date: 25-01-2022
Semester : I
Name of the Program: M.Tech (Structural Engineering) Year: I
Course/Subject: **Matrix methods in Structural Analysis(GR20D5001)**
Name of the Faculty :Dr.GVV Satyanarayana. Dept.: Civil Engineering
Designation : PROFESSOR

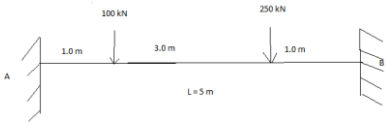
This Tutorial corresponds to Unit No. 3/ Lesson **Introduction about Flexibility matrix method(Force Method) And application to indeterminate beams**

Q1.Explain the stepwise procedure to analyze the statically indeterminate structures using Force (Flexibility) matrix and Displacement (Stiffness) Methods.

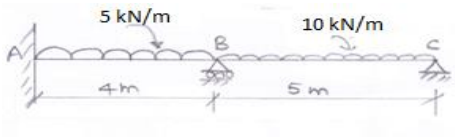
Q2. Analyse the propped cantilever beam given below using Force ethod.



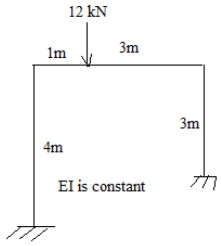
Q2. Determine the support moments and reactions of fixed beam using flexibility methods.



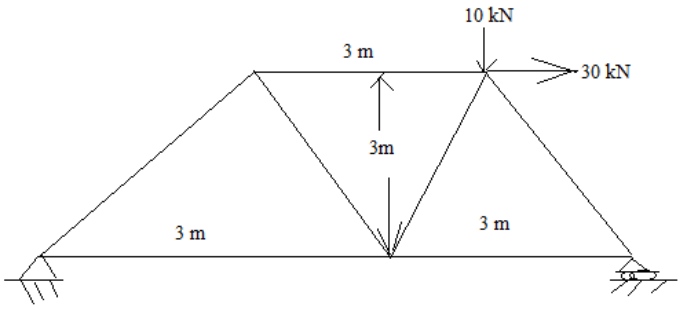
Q3. Analyze the continuous beam using flexibility matrixmethod as shown in figure.
Let $I_{ab} = 1.5\ I_{bc}$.



Q4. Analyse the portal frame as shown below using forcemethod. Take EI as constant.



Q5. Analyse the truss as shown below using flexibilitymatrix method.



Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.: 3

Outcome Nos.: 3

Signature of HOD

Signature of faculty

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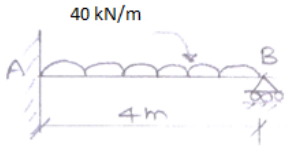
TUTORIAL SHEET - 4

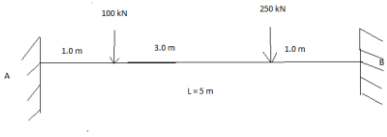
Academic **Y**ear : 2021-22 Date: 11-02-2022
Semester : I
Name of the Program : M.Tech (Structural Engineering) Year: I
Course/Subject : **Matrix methods in Structural Analysis(GR20D5001)**
Name of the Faculty :Dr.GVV Satyanarayana. Dept.: Civil Engineering
Designation : PROFESSOR

This Tutorial corresponds to Unit No. 4/ Lesson Introduction about stiffness matrix method(Displacement Method)

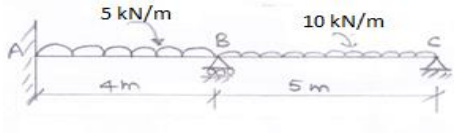
Q1. Explain the stepwise procedure to analyze the statically indeterminate structures using displacement
or Stiffness matrix and Displacement (Stiffness) Methods.
Q2. Analyse the propped cantilever beam given below using Displacement method.



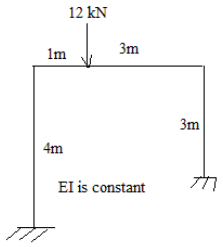
Q2. Determine the support moments and reactions of fixed beam using stiffness matrix methods.



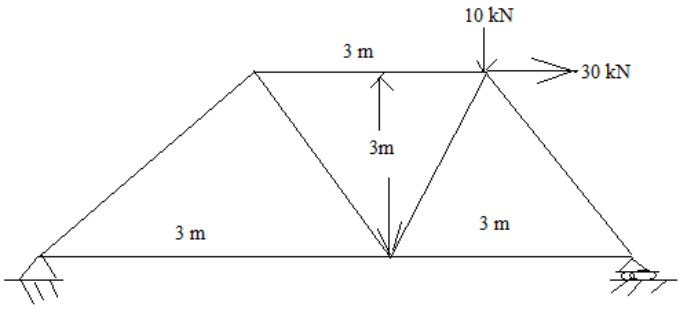
Q3. Analyze the continuous beam using flexibility stiffness method as shown in figure.
Let $I_{ab} = 1.5\, I_{bc}$.



Q4. Analyse the portal frame as shown below using force method. Take EI as constant.



Q5. Analyse the truss as shown below using stiffness matrix method.



Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.
Objective Nos.: 4
Outcome Nos.: 4

Signature of HOD

Signature of faculty

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TUTORIAL SHEET - 5

Academic **Y**ear : 2021-22 Date:28-02-2022
Semester : I
Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject : **Matrix methods in Structural Analysis(GR20D5001)**
Name of the Faculty :Dr.GVV Satyanarayana. Dept.: Civil Engineering

Designation : PROFESSOR
This Tutorial corresponds to Unit No. 5/ Lesson **Special analysis procedures**
Q1.Describe the Importance about special analysis proceduresusing in structural analysis.
Q2.What is static condensation and explain its importance
Q3.Explain static condensation with suitable example
Q4. What is sub-structuring and write Importance of sub structuring in structural analysis
Q5. What is effect due to initial and thermal stress in structures?
Q6.What are the uses of shear walls and their location in large structures?
Q7. What are the varieties or shapes of shear walls?
Q8. Describe the behaviour of shear walls in large frames with and without shear walls.
Q9. Explain the different method in analysis of shear walls.

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.
Objective Nos.: 5
Outcome Nos.: 5

Signature of HOD Signature of faculty

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ASSIGNMENT SHEET – 1

Academic **Y**ear : 2021-22 Date:07-12-2021

Semester : I

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject : **Matrix Methods in Structural Analysis (GR20D5001)**

Name of the Faculty : Dr.G.V.V. Satyanarayana Dept. Civil Engineering

Designation : PROFESSOR

This Assignment corresponds to Unit No.1

Q1. What is Static and kinematic indeterminacy of structures? Derive static and kinematic indeterminacy
for given structures.

Q2.Differentiate between static determinate and indeterminate structures.
Q3.What is transformation matrix and its use?
Q4.Deduce the relationship between flexibility and stiffness matrices.
Q5. Derive displacement equations for truss and beam elements.
Q6. Define the terms dof and redundants at supports.
Q7. Differentiate local and global co-ordinates and how they are interconnected

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.:
…….

Outcome Nos.:
…….

Signature of HOD Signature of faculty

Date: Date:

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

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ASSIGNMENT SHEET – 2

Academic **Y**ear : 2021-22 Date:24-12-2021

Semester : I

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject : **Matrix Methods in Structural Analysis (GR20D5001)**

Name of the Faculty : Dr.G.V.V. Satyanarayana Dept. Civil Engineering

Designation : PROFESSOR

This Assignment corresponds to Unit No-2.

Q2. Explain the procedure to deduce a stiffness matrix using direct stiffness method.
Q3.Derive stiffness matrix for any structure with assigned co-ordinates.
Q4.What is Rank of matrix and evaluate the rank of matrix for the given matrix?
Q5. What is semi band width and explain its importance in structural analysis?
Q6. Write a computer alogarithm to deduce final forces in a truss member using stiffness matrix approach.
Q7. How to assemble the stiffness matrices?
Q8. Discuss on various boundary conditions used FEM.

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.:
2…….

Outcome Nos.:
2…….

Signature of HOD Signature of faculty

Date: Date:

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ASSIGNMENT SHEET – 3

Academic **Y**ear : 2021-22 Date:25-01-2022

Semester : I

Name of the Program : M.Tech (Structural Engineering) Year: I

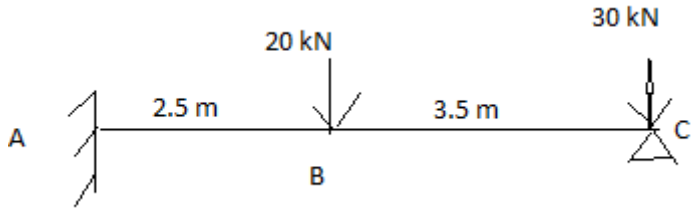
Course/Subject : **Matrix Methods in Structural Analysis (GR20D5001)**

Name of the Faculty : Dr.G.V.V. Satyanarayana Dept. Civil Engineering

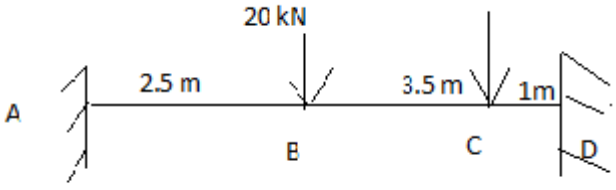
Designation : PROFESSOR
Designation : PROFESSOR

This Assignment corresponds to Unit No.3

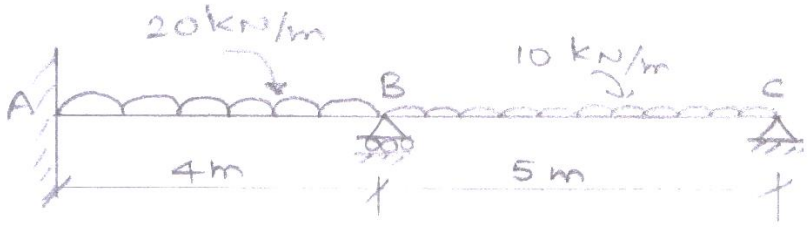
Q1.Develop a flexibility matrix for the structure with assigned co-ordinates.
Q2. Analyse the propped cantilever beam using flexibility matrix method as shown below.



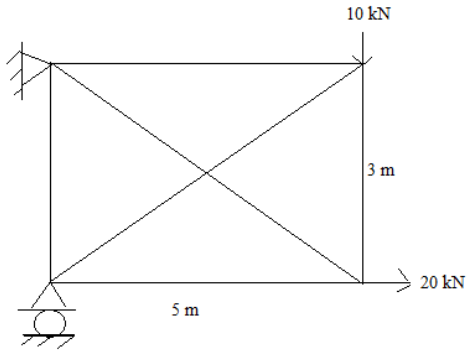
Q3.Determine the support moments and also draw SFD and BMD's of a fixed beam as shown in the figure below using force method.



Q3.Analyze the continuous beam as shown in figure below using flexibility method if the support C sinking 10 mm. Take EI = 18000 kn-m^2.



Q4.Explain the stepwise procedure to analyze a portal frame in flexibilty matrix method.
Q5. Analyse the truss as shown below using force method.



Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.:3…….

Outcome
Nos.:3…….

Signature of HOD

Signature of faculty

Date:

Date:

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090, (040) 6686 4440

ASSIGNMENT SHEET – 4

Academic **Y**ear : 2021-22 Date:11-02-2021

Semester : I

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject : **Matrix Methods in Structural Analysis (GR20D5001)**

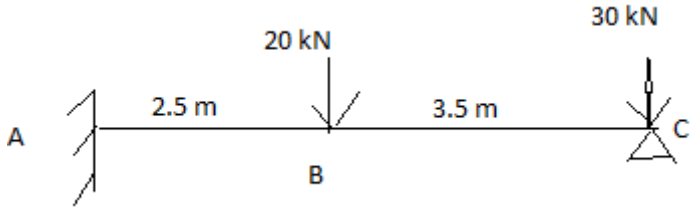
Name of the Faculty : Dr.G.V.V. Satyanarayana Dept. Civil Engineering

Designation : PROFESSOR

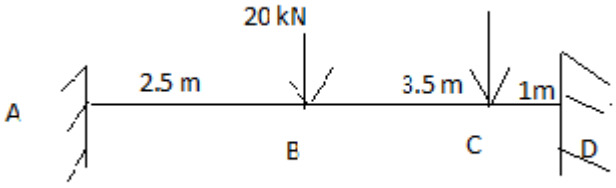
Designation : PROFESSOR

This Assignment corresponds to Unit No-4.

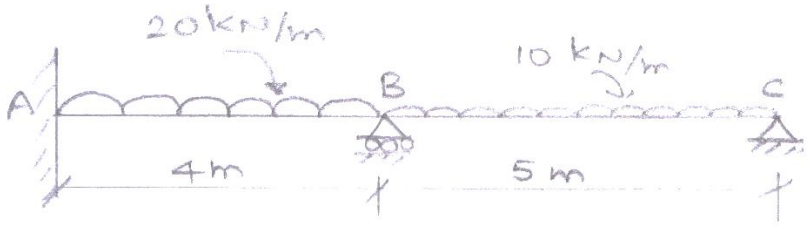
Q1.Develop a stiffness matrix for the structure with given dof's.
Q2. Analyse the propped cantilever beam using stiffness matrix method as shown below.



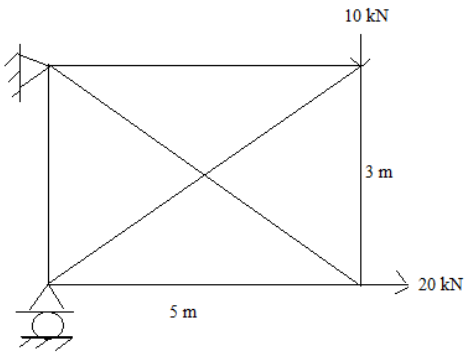
Q3. Determine the support moments and also draw SFD and BMD's of a fixed beam as shown in the figure below using displacement method.



Q3. Analyze the continuous beam as shown in figure below using stiffness matrix method if the support C sinking 10 mm. Take EI = 18000 kn-m^2.



Q4. Explain the stepwise procedure to analyze a portal frame in stiffness matrix method.
Q5. Analyse the truss as shown below using force method.



Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.:
4…….

Outcome Nos.:
4…….

Signature of HOD

Signature of faculty

Date:

Date:

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090, (040) 6686 4440

ASSIGNMENT SHEET – 5

Academic **Y**ear : 2021-22 Date:28-02-2022

Semester : I

Name of the Program : M.Tech (Structural Engineering) Year: I

Course/Subject : **Matrix Methods in Structural Analysis (GR20D5001)**

Name of the Faculty : Dr.G.V.V. Satyanarayana Dept. Civil Engineering

Designation : PROFESSOR

This Assignment corresponds to Unit No-5.

Q1. Explain the Importance about special analysis procedures.
Q2. What is static condensation and explain its importance?
Q3.Explain static condensation with suitable example.
Q4.What is sub-structuring and explain the Importance of sub structuring in structural analysis?
Q5.What is effect due to initial and thermal stress in structures?
Q6. Discuss in analysis of special structures.
Q7. Explain the term static condensation and describe with suitable example.
Q8. What is shear wall and list various types of shear walls.
Q9. Explain the role of shear walls in large structures and also explain with their locations.
Q10. Describe the behaviour of shear wall in large frames with and without shear walls.
Q11. Explain the different analysis methods of shear walls.

Please write the Questions / Problems / Exercises which you would like to give to the students and also mention the Objectives/Outcomes to which these Questions / Problems / Exercises are related.

Objective Nos.:
5…….

Outcome Nos.:
5…….

Signature of HOD Signature of faculty

Date: Date:

RUBRIC SHEET

Academic **Y**ear : 2021-22
Semester : I
Name of the Program: M.Tech Structural EngineeringYear: I
Course/Subject: **Matrix Methods in Structural Analysis** Course Code:**GR20D5001**
Name of the Faculty:Dr.G V VSatyanarayana Dept.: Civil Engineering
Designation: Professor
Objective: To learn basics and concepts of Structural analysis.
Student Outcome: Behavioural studies or analyze the structural elements under loading and study different parameters such as induced forces, bending moments, shear forces, stresses, strains, deflection etc.,

			Beginning	**Developing**	**Reflecting Development**	**Accomplished**	**Exemplary**	**Score**
S. No	**Name of the Student**	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
1	21241D2010	Analysis of structural elements	Low level of knowledge on calculation of support reactions	Able to discuss the principles of energy theorems	Ability to explain the application of energy theorems	Full knowledge on application of energy theorems	Analyzing and implement in structures	5
		The level of knowledge on types structures such as arches, statically determinate and indeterminate beams	Low level of knowledge on types structures such as arches, statically determinate and indeterminate beams	Able to discuss types of structures and their importance in civil engineering constructions	Ability to explain types of structures and their importance in civil engineering constructions	Full knowledge on types of structures and their importance in civil engineering constructions	Analysing and application of knowledge on types of structures and their importance in civil engineering constructions	4
		The level of knowledge to analyse various engineering structures.	Low level of knowledge to analyse various engineering structures.	Ability to discuss and to study the various engineering structures	Ability to explain various engineering structures.	Full knowledge on various engineering structures.	Analysing and implementing the knowledge of various engineering structures.	3
							Average Score	4

MAPPING

GR20D5001 Matrix Methods in Structural Analysis	Course Outcomes				
Course Objectives	1	2	3	4	5
1	X				
2		X			
3			X		
4				X	
5					X

Assessments

1. Assignment 2. Internal Examination 3. External Examination

4. Practical Projects 5. Viva

GR20D5001 Matrix Methods in Structural Analysis	Course Objectives				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4					
5					

GR20D5001 Matrix Methods in Structural Analysis	Course Outcomes				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4					
5					

Course	Program Outcomes					
	1	2	3	4	5	6
GR20D5001 Matrix Methods in Structural Analysis	X	X	X	X	X	X

GR20D5001 Matrix Methods in Structural Analysis	Program Outcomes					
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**
Evaluate the static and kinematic indeterminacy and generate stiffness and flexibility matrices.	M		M	M	H	M
Analyse the skeleton structures using stiffness method under different coordinate system.	M		M	M	M	M
Use flexibility matrix method to analyse different structures.	M		H	M	M	M
Use stiffness matrix method to analyse different structures.	M	M	H	M	H	M
Analyse various types of structural members using special analysis procedures and shear walls in multi storied constructions	M	M	M	M	M	M

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

COURSE COMPLETION STATUS

-**A**cademic **Y**ear : 2021-22

Semester : I

Name of the Program: M.Tech (Structural Engineering) Year: I

Course/Subject: **Matrix Methods in Structural Analysis** Course Code:**GR20D5001**

Name of the Faculty: Dr.GVVSatyanarayanaDept.:Civil Engineering

Designation: PROFESSOR

Actual Date of Completion & Remarks, if any

Units	**Remarks**	**No. of Objectives Achieved**	**No. of Outcomes Achieved**
Unit 1	Introduction to Matrix methods of Analysis	1	1
Unit 2	Assembly of stiffness matrices	2	2
Unit 3	Introduction about Flexibility matrix method(Force Method) And application to indeterminate beams	3	3
Unit 4	Introduction about Special analysis procedures	4	4
Unit 5	Special analysis procedures	5	5

Signature of HOD Signature of faculty

Date: Date:

Note: After the completion of each unit mention the number of Objectives & Outcomes Achieved.

GokarajuRangarajuInstitute
ofEngineeringandTechnology(Autonomous)DepartmentofCivilEngineering
IM.Tech.ISemesterMIDI IEXAMINATION February-2022

Matrix Methods in Structural Engineering (GR20D5001)

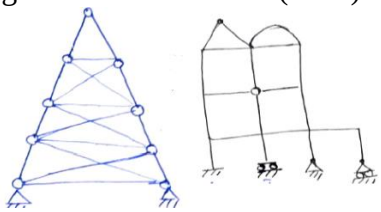
Time:75Minutes **Dateofexamination 07-02--202** **Max.Marks:15Marks**

Answerallquestions **3x5=15Marks**

Name:_____ RollNo. | | | | | | D | | | | |

Part-B

1. a)Distinguish between Static and Kinematic indeterminacies. 2M(CO1)[BL4]
b)Evaluate Static and Kinematic of given structures:3 M (CO 3)



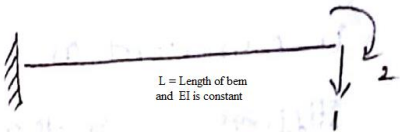
OR

c) Determine kinematic indeterminacy of above structures 3 M (CO1)[BL4]
d) Distinguish between local and global coordinates. 2 M (CO 1) [BL4]

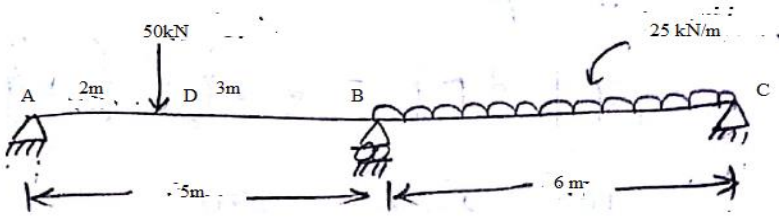
2. a) Compare stiffness matrix using direct stiffness method.. 2 M (CO2) [BL4]
b)Explain the procedure for assemblage of stiffness matrices. 3 M (CO4) [BL4]

OR

c) Evaluate the stiffness matrix for the given below structure: 5 M (CO4) [BL4]

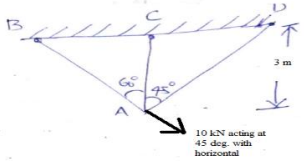


3. (a) Analyse the beam as shown below using Flexibility matrix method. M (CO3) [BL4]



OR

(b) Analyse the truss as shown below using Flexibility matrix method. 5 M (CO5) [BL4]



GokarajuRangarajuInstituteof EngineeringandTechnology(Autonomous)
DepartmentofCivilEngineering
IM.Tech.ISemesterMIDIIEXAMINATION February-2022
Matrix Methods in Structural Engineering (GR20D5001)

Time: 15Minutes	**Dateofexamination:-02-2022**	**Max.Marks:5Marks**
Answerallquestions	**Allquestionscarryequalmarks**	**10X $\frac{1}{2}$=5Marks**

Name:____

				D				

Choosethecorrectanswers.

1. The origin lies in natural co-ordinate system is _____ [ ]
   A) At centreof element B) Any one side of element C) away from element D) Either A or B

2. The value of increases means the deformation leads to _____ [ ]
   A)IncreaesB) decreasesC) Can't sayD) Either A or B

3. The relation between Flexibility and Stiffness will be proportional to _____ [ ]
   A) Directly B) Inverse C) Either A or B D) None of the above

4. The moment required to produce unit rotation when far end is hinged or simply supported [ ]

   $A)\ \frac{2EI\theta}{L}$ B) $\frac{EI\theta}{L} C)\ \frac{4EI\theta}{L}$ D) $\frac{6EI\theta}{L}$

5. The moment required to produce unit rotation when far end is fixed [ ]

   A)$\frac{6EI\delta}{l^2}$ B) $\frac{3EI\delta}{l^2}$ C) $\frac{4\,EI\delta}{l^2}$ D) $\frac{EI\delta}{l^2}$

6 Which matrix method is suitable when DSI >KID [ ]
A) Flexibility Matrix method B)Stiffness matrix methodC) Either A or BD) both are not suitable

7. If given structure dof is equals to 2, the size of stiffness matrix is equals to [ ]
   A) 2 X 2 B) 1 X 1 C) 3 X 3 D) 2 x1

8. The number of redundants at hinged support will be equal to _____ [ ]
   A) 1 B) 2 C) 3 D) Zero

9. The degree of freedom (dof) for fixed support will be equal to _____ [ ]
A) 1 B) 2 C) 3 D) Zero

10. The stiffness matrix method is also known as_____ [ ]
    A) Flexibility matrix method B) Force method C) Displacement method D) Either A or B

GokarajuRangarajuInstitute ofEngineeringandTechnology(Autonomous)DepartmentofCivilEngineering

IM.Tech.ISemesterMID I IEXAMINATION March--2022

Matrix Methods in Structural Engineering (GR20D5001)

Time:75Minutes **Dateofexamination 14-03--202** **Max.Marks:15Marks**

3x5=15Marks

Name:_____ RollNo.

					D				

Answer all questions.

Part-B

1. a. Analyze the given frame using force method as shown in figure:1 below:

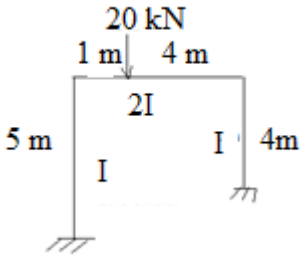


Figure:1BL-4(CO-3) (5M)

OR

b. Analyze the given frame using force method as shown in figure below:

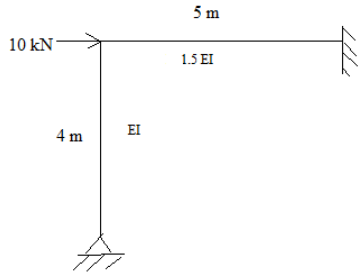


Figure:2 BL-4 (CO-3) (5M)

2. a. Illustrate B.M.D for the frame as shown in figure:1 using displacement method.

BL-2 (CO-4) (5M)

OR

b.Illustrate B.M.D for the frame as shown in figure:2 using displacement method.

BL-2 (CO-4) (5M)

3. a. Explain static condensation with suitable example.BL-5(CO-5) (5M)

OR

b. What is effect due to thermal stress in structures? BL-1(CO-5) (2M)

c. Distinguish between different methods of analysis of shear wallsBL-4(CO-5) (3M)

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)
Department of Civil Engineering
I M.Tech. I Semester MID I I EXAMINATION February-2022
Matrix Methods in Structural Engineering (GR20D5001)

Time: 15Minutes **Date of examination:-07-02-2022** **Max.Marks:5Marks**
Answer all questions **All questions carry equal marks** **10X $\frac{1}{2}$=5Marks**

Name:____

				D				

Choose the correct answers.

5. The origin lies in natural co-ordinate system is _____ ` [ ]
   B) At centre of element B) Any one side of element C) away from element D) Either A or B

6. The value of increases means the deformation leads to _____ [ ]
   A) Increaes B) decreases C) Can't say D) Either A or B

7. The relation between Flexibility and Stiffness will be proportional to _____ [ ]
   B) Directly B) Inverse C) Either A or B D) None of the above

8. The moment required to produce unit rotation when far end is hinged or simply supported [ ]

   $A)\ \frac{2EI\theta}{L}$ B) $\frac{EI\theta}{L}C)\ \frac{4EI\theta}{L}$ D) $\frac{6EI\theta}{L}$

5. The moment required to produce unit rotation when far end is fixed [ ]

   A)$\frac{6EI\delta}{l^2}$ B) $\frac{3EI\delta}{l^2}$ C) $\frac{4\,EI\delta}{l^2}$ D) $\frac{EI\delta}{l^2}$

6 Which matrix method is suitable when DSI >KID [ ]
   A) Flexibility Matrix method B)Stiffness matrix method C) Either A or B D) both are not suitable

7. If given structure dof is equals to 2, the size of stiffness matrix is equals to [ ]
   A) 2 X 2 B) 1 X 1 C) 3 X 3 D) 2 x1

8. The number of redundants at hinged support will be equal to _____ [ ]
   A) 1 B) 2 C) 3 D) Zero

9. The degree of freedom (dof) for fixed support will be equal to _____ [ ]
   A) 1 B) 2 C) 3 D) Zero

10. The stiffness matrix method is also known as_____ [ ]
   A) Flexibility matrix method B) Force method C) Displacement method D) Either A or B

I M.Tech I Semester Regular Examinations, June 2021

MATRIX METHODS IN STRUCTURAL ANALYSIS

(Structural Engineering)

Time: 3 hours **Max Marks: 70**

< **Note: T**ype the questions in the given format only, Times New Roman font , size 12 >

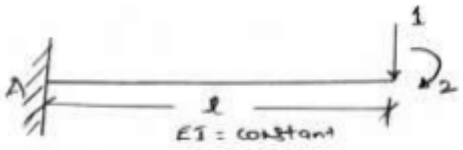
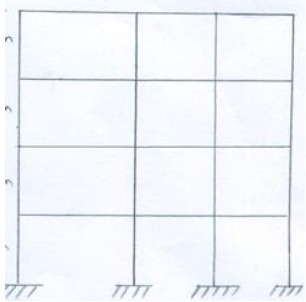
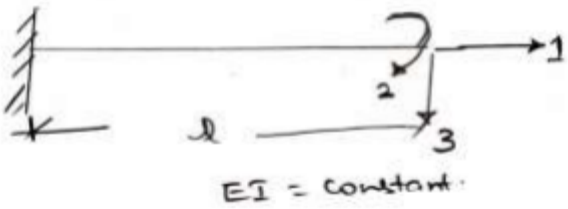
Instructions:

1. Question paper comprises of **Part-A** and **Part-B**
2. **Part-A** (for 20 marks) must be answered at one place in the answer book.
3. **Part-B** (for 50 marks) consists of **five questions with internal choice,** answer all questions.

PART – A

(Answer ALL questions. All questions carry equal marks)

10 * 2 = 20 Marks

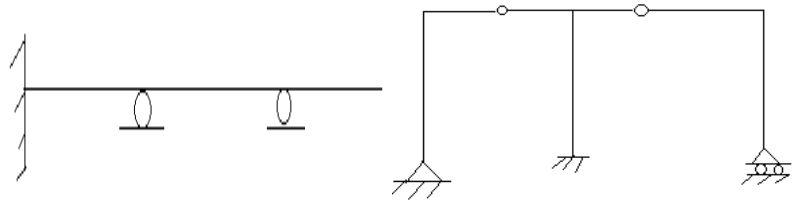
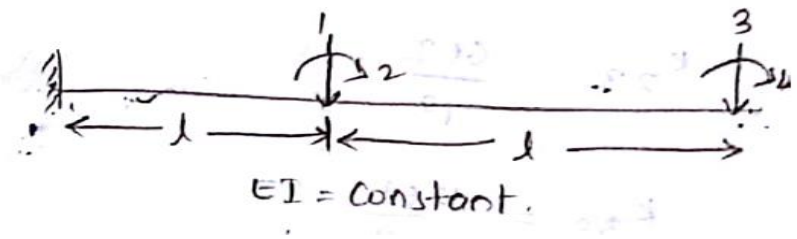
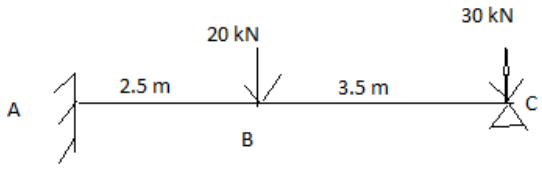
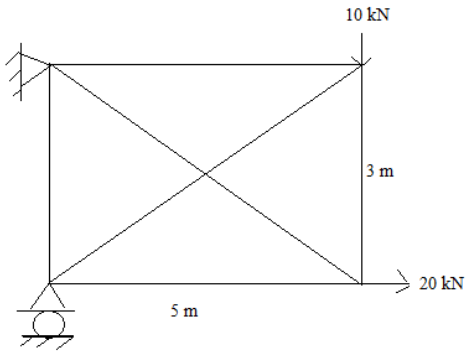
1. a.	Distinguish between static and kinematic indeterminacies.	**[2]**	**CO 1**	**BL 4**
b.	What is transformation matrix?	**[2]**	**CO 1**	**BL 1**
c.	The stiffness matrix of a beam is given as $\begin{bmatrix} 5 & 2 \\ 2 & 4 \end{bmatrix}$, when the nodal forces are $\begin{bmatrix} 10 \\ 7 \end{bmatrix}$ find the nodal displacements	**[2]**	**CO 2**	**BL 1**
d.	Explain about local and global coordinates with suitable sketches	**[2]**	**CO 2**	**BL 2**
e.	Evaluate the flexibility matrices for the given co-ordinate system: 	**[2]**	**CO 3**	**BL 5**
f.	Determine the static in determinacy of the given structure. 	**[2]**	**CO 3**	**BL 5**
g.	Evaluate the stiffness matrices for the given dof's: 	**[2]**	**CO 4**	**BL 5**
h.	List out the properties of stiffness matrix.	**[2]**	**CO 4**	**BL 1**
i.	Explain the effects temperature in various structures	**[2]**	**CO 5**	**BL 2**
j.	Draw various types of shear walls with their advantages	**[2]**	**CO 5**	**BL 1**

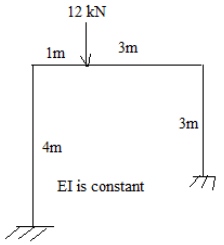
PART – B

(Answer ALL questions. All questions carry equal marks)

5 * 10 = 50 Marks

2.	**(a)** Define the term of degree of freedom and explain in detail with suitable structures.	**[5]**	**CO 1**	**BL 5**

	(b)Find the kinematic in determinacy indeterminacy of the structures given below: 	**[5]**	**CO 1**	**BL 1**
	OR			
3.	(a) When did you prefer stiffness matrix method over flexibility matrix method explain with suitable example	**[5]**	**CO 1**	**BL 1**
	(b) Explain briefly transformation of coordinates with suitable figure	**[5]**	**CO 1**	**BL 2**
4.	(a) Generate or Develop stiffness matrix for the given structure using Direct Stiffness method or approach 	**[10]**	**CO 2**	**BL 3**
	OR			
5.	**(a)** Explain the methodology of assemblage of stiffness matrices.	**[5]**	**CO 2**	**BL 2**
	(b) Explain the stepwise procedure in analysis of kinematically in determinate structures using stiffness matrix method	**[5]**	**CO 2**	**BL 2**
6.	**(a)** Analyse the propped cantilever beam as shown below using flexibility matrix method. 	**[10]**	**CO 3**	**BL 4**
	OR			
7.	**(a)** Analyse the plane truss as shown below using force method. 	**[10]**	**CO 3**	**BL 4**
8.	**(a)** Analyse the continuous beam using stiffness method as shown in figure. Let $I_{ab} = 1.5\ I_{bc}$.	**[10]**	**CO 4**	**BL 4**

				
	OR			
9.	**(a)** Analyse the portal frame as shown below using displacement method. Take EI as constant. 	**[10]**	**CO 4**	**BL 4**
10.	(a) Explain the term static condensation and describe with suitable example	**[5]**	**CO 5**	**BL 2**
	(b) Discuss in analysis of special structures.	**[5]**	**CO 5**	**BL 6**
	OR			
11.	(a) Discuss the behaviour of shear wall in large frames with and without shear wall.	**[5]**	**CO 5**	**BL 6**
	(b) Explain any two different analysis methods of shear walls.	**[5]**	**CO 5**	**BL 2**

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GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

M.Tech StructuralEngg. I yr-I Sem- GR20 2021-22

Matrix Methods in Structural Analysis GR20D5001 (MID-I)

S.No	Roll No	Name of Student	Maximum Marks (20 M)
1	21241D2001	ATKAPURAM PRASHANTH	13
2	21241D2002	BANDI SRI RAM GOPAL	17
3	21241D2003	CHALLA MADHAVI	15
4	21241D2004	PAMMI DIVYA	13
5	21241D2005	DUMMA UMESH KUMAR	18
6	21241D2006	K LATHASREE	17
7	21241D2007	MARIYALA VAISHNAVI	18
8	21241D2008	MAVOORI PRANAV	14
9	21241D2009	MITTAPALLI NAGA ASHWINI	16
10	21241D2010	RAVULA VENKATA SURAJ REDD	7
11	21241D2011	REPATI MOHAN BABU	13
12	21241D2012	ANDHYA CHERUKU	16
13	21241D2013	SHAIK FEROZ	16
14	21241D2014	K SAI CHANDRA	15
15	21241D2015	THOTA HARSHAVARDHAN	11
16	21241D2016	ARIKUPPALA LALITHA	16
17	21241D2017	AMBA RAMA GNANENDRA SAI	12
18	21241D2018	SAI YENUMALA DEVESH GOUD	11
19	21241D2019	RASHANTH KUMAR	AB
20	21241D2020	BAVANDLAPELLI THARUN TEJA	AB
21	21241D2021	GNITISH KUMAR	4

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

M.Tech Structural Engg. I yr-I Sem- GR20 2021-22

Matrix Methods in Structural Analysis GR20D5001 (MID-II)

S.No	Roll No	Name of Student	Maximum Marks (20 M)
1	21241D2001	ATKAPURAM PRASHANTH	12
2	21241D2002	BANDI SRI RAM GOPAL	16
3	21241D2003	CHALLA MADHAVI	9
4	21241D2004	PAMMI DIVYA	14
5	21241D2005	DUMMA UMESH KUMAR	16
6	21241D2006	K LATHASREE	15
7	21241D2007	MARIYALA VAISHNAVI	17
8	21241D2008	MAVOORI PRANAV	11
9	21241D2009	MITTAPALLI NAGA ASHWINI	16
10	21241D2010	RAVULA VENKATA SURAJ REDD	5
11	21241D2011	REPATI MOHAN BABU	8
12	21241D2012	ANDHYA CHERUKU	11
13	21241D2013	SHAIK FEROZ	3
14	21241D2014	K SAI CHANDRA	14
15	21241D2015	THOTA HARSHAVARDHAN	12
16	21241D2016	ARIKUPPALA LALITHA	14
17	21241D2017	AMBA RAMA GNANENDRA SAI	8
18	21241D2018	SAI YENUMALA DEVESH GOUD	8
19	21241D2019	RASHANTH KUMAR	AB
20	21241D2020	BAVANDLAPELLI THARUN TEJA	AB
21	21241D2021	GNITISH KUMAR	10

Gokaraju Rangaraju Institute of Engineering & Technology

(Autonomous College Affiliated to JNTUH) (12 Pages)

Bachupally, Kukatpally, Hyderabad - 500090

I	II	MID TERM EXAMINATION

No. 395224

H.T. No.	2	1	2	4	1	D	2	0	0	7

Name of the Examination I - Mtech I sem I- mid.

Course M-Tech Branch STU Date 07/02/22.

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	2+2			5	4								13

START WRITING FROM HERE

1. a. Static Indeterminacies.

A structure is said to be statically indeterminate when equilibrium equations alone cannot find the equations.

Ds → Internal (Dsi)

Ds → External (Dse)

Dse = r-3, r-6 ; r = external reactions
rigid frame, rigid space

Dsi = 3C, 6C ; C = No. of cuts required to make structure unstable
plane frame, space frame

For example,

Ds = r - 3
= (4-3)
= 1

Kinematic indeterminacies.

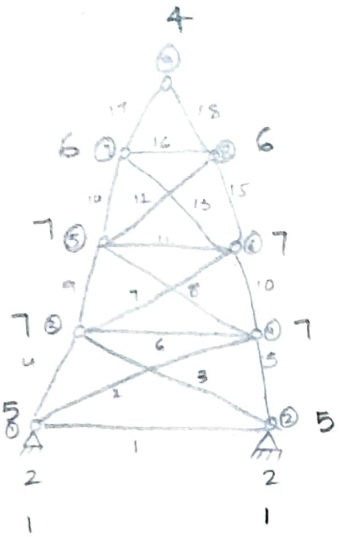
A structure is said to be kinematically indeterminate when compatability equations alone cannot find the joint displacement equations.

$D_K = NJ - r$; N = No. of degree of freedom.

J = Joints

r = reactions.

b. Static and kinematic indeterminacy.



$D_S = (2m + r) - 2j$ (pin jointed plane frame)

$r = 2 + 2$

$= 4$

$m = 18$

$j = 9$

$D_S = (2 \times 18 + 4) - 2 \times 9$

$= 22.$

$D_K = NJ - r$

$J = 9$

$r = 2 + 2$

$= 4$

$N = 2 \times 9 - 4$

$= 18 - 4$

$= 14$

DOI 0 1 1 2

(or)

$D_s = 3-3$

$(3+2+2+1)-3$

$= 5$

$D_{si} = 3C = 3\times6$

$= 18$

$D_s = D_{sc} + D_{si}$

$= 5+18$

$= 23-4$

$= 19$

$D_s = (3m+r) - 3j$

$= (3\times 20+8) - 3\times 15$

$= 23-4$

$= 19$

D_r :

Rigid joints $\longrightarrow 9\times 3 = 27$

supports $\longrightarrow 0+1+1+2 = 4$

Hinge $\longrightarrow 4+6 = 10$

41

with axial strains

$41-M = 41-20 = 21$ (with out axial strains).

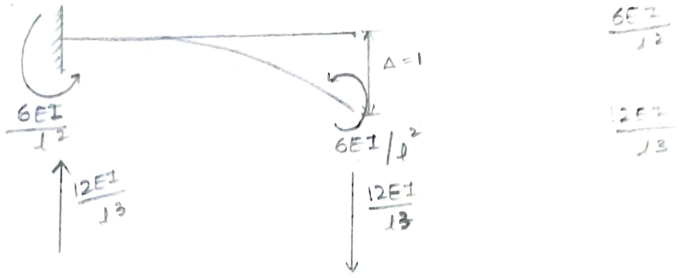
2.
c.

Here the given co-ordinates are two. Therefore size of stiffness matrix is 2×2.

$$K = \begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix}$$

Release unit displacement co-ord 1 to find the first column of stiffness matrix.

ie, K_{11}, K_{21}.

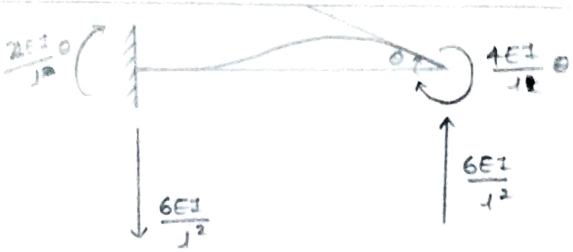


$$K_{11} = \frac{12EI}{l^3}$$

$$K_{21} = -\frac{6EI}{l^2}$$ (co-ord-2 clockwise - moment counter clockwise) -ve.

Release unit ~~load~~ rotation co-ord 2 to find the second column of stiffness matrix.

ie, $K_{12} = K_{22}$



$$K_{12} = -\frac{6EI}{l^2}$$

$$K_{22} = \frac{4EI}{l}$$

Therefore, stifness matrix K is

$$K = \begin{bmatrix} \frac{12EI}{l^3} & -\frac{6EI}{l^2} \\ -\frac{6EI}{l^2} & \frac{4EI}{l} \end{bmatrix}$$

$$K^T = \begin{bmatrix} \frac{12EI}{l^3} & -\frac{6EI}{l^2} \\ -\frac{6EI}{l^2} & \frac{4EI}{l} \end{bmatrix}$$

1. $K = K^T$.
2. Diagonal elements are positive.

3.(a)

1. Find static indeterminacy.

$D_s = 3 - 2 = 1$

Since, the redundants are 1, flexibility matrix size = 1×1

Step - 2

Release the ~~redundant~~ redundant in the structure

Now, find joint displacement due to external loading.

$$\delta_1 = \theta_b = \frac{Wab}{6EIl}(l+b) + \frac{Wl^3}{24EI}$$

$$= \frac{50\times2\times3}{6\times5EI}(5+3) + \frac{25\times6^3}{24EI}$$

$$= \frac{80}{EI} + \frac{225}{EI}$$

$$= \frac{305}{EI}$$

Now find the flexibility matrix

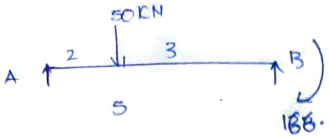
$$f = [f_{11}] = \frac{1_{AB}\cdot\overline{1}_{BC}}{6EI} + \frac{1_{BC}\cdot\overline{1}_{BC}}{6EI} = \frac{5}{6EI} + \frac{6}{6EI} = \frac{11}{6EI}$$

$$[f]\{R\} = \{\delta\}_0 - \{\delta\}_L$$

$$\left[\frac{11}{6EI}\right]\{R_1\} = 0 - \left\{\frac{305}{EI}\right\}$$

$$R_1 = -\frac{305\times6}{11}$$

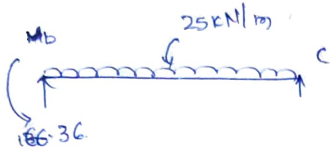
$$R_1 = -166.36$$



$\Sigma M_b = 0$

$-R_a \times 5 + 50 \times 3 + 166.36 = 0$

$R_a = 63.27\ KN$



$\Sigma M_b = 0$

$R_c \times 6 - 25 \times 6 \times \frac{6}{2} + 166.36 = 0$

$R_c = 47.27\ KN.$

$R_a + R_b + R_c = (50 + 25 \times 6)$

$= 200$

$R_b = 200 - (R_a + R_c)$

$= 89.46$

BM of beam ab

$$\frac{Wab}{l} = \frac{50 \times 2 \times 3}{5}$$

$= 60\ KN\text{-}m.$

Beam bc

$$\frac{Wl^2}{8} = \frac{25 \times 6^2}{8}$$

$= 112.5\ KN\text{-}m.$

GokarajuRangaraju

InstituteofEngineeringandTechnology (Autonomous)

Department of Civil Engineering

I M.Tech. ISemester MID I EXAMINATION February-2022

Matrix Methods in Structural Engineering (GR20D5001)

Time: 15Minutes **Dateofexamination:-07-02-2022 (FN)** **Max.Marks : 5Marks**

Answerallquestions **Allquestionscarryequalmarks** **10 X 1/2=5Marks**

Name: M. Vaishnavi

2	1	2	4	1	D	2	00	7

Choosethecorrectanswers.

1. The origin lies in natural co-ordinate system is _____ [A]
   A) At centreof element B) Any one side of element C) away from element D) Either A or B

2. The value of increases means the deformation leads to _____ [C]
   A)Increaes B) decreases C) Can't say D) Either A or B

3. The relation between Flexibility and Stiffness will be proportional to _____ [B]
   A) Directly B) Inverse C) Either A or B D) None of the above

4. The moment required to produce unit rotation when far end is hinged or simply supported [D]
   A) $\frac{2EI\theta}{L}$ B) $\frac{EI\theta}{L}$ C) $\frac{4EI\theta}{L}$ D) $\frac{6EI\theta}{L}$

5. The moment required to produce unit rotation when far end is fixed $\frac{4EI}{l^2}$ [C]
   A) $\frac{6EI\delta}{l^2}$ B) $\frac{3EI\delta}{l^2}$ C) $\frac{4EI\delta}{l^2}$ D) $\frac{EI\delta}{l^2}$

6 Which matrix method is suitable when DSI >KID - Flexibility matrix. [B]
   A) Flexibility Matrix method B)Stiffness matrix method
   C) Either A or B D) both are not suitable

7. If given structure dof is equals to 2, the size of stiffness matrix is equals to (2X2) [A]
   A) 2 X 2 B) 1 X 1 C) 3 X 3 D) 2 x1

8. The number of redundants at hinged support will be equal to 2 [B]
   A) 1 B) 2 C) 3 D) Zero

9. The degree of freedom (dof) for fixed support will be equal to 0 [D]
   A) 1 B) 2 C) 3 D) Zero

10. The stiffness matrix method is also known as Displacement method. [C]
    A) Flexibility matrix method B) Force method
    C) Displacement method D) Either A or B

D. Harika

Gokaraju Rangaraju Institute of Engineering & Technology

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Bachupally, Kukatpally, Hyderabad - 500090

I	II	MID TERM EXAMINATION

No. 393638

H.T. No.	2	1	2	4	1	D	2	0	1	5

Name of the Examination M.Tech 1st year 1st semester MID I EXAM MMSA

Course M.Tech Branch CIVIL Date 07-02-2022

Signature of the Invigilator

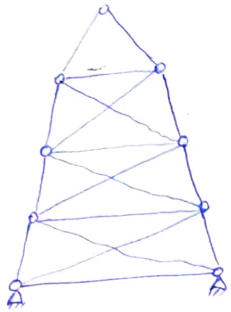
Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS													

START WRITING FROM HERE

1. (a) Differences between Static and Kinematic Indeterminacies:

Static Indeterminacy	Kinematic Indeterminacy
1. Degree of Static indeterminacy is denoted by D_S (or) DSI	1. Degree of Kinematic indeterminacy is denoted by D_K (or) DKI.
2. Degree of Static indeterminacy depends upon reactions, joints and no: of member in a given structure	2. Degree of Kinematic indeterminacy ~~depends~~ is also independent of no: of reactions, joints and members but not as of Degree of Static indeterminacy
3. Degree of Static indeterminacy is $D_S = 3m + (r - 3j)$ is the dependancy of above elements.	3. Degree of Kinematic indeterminacy $D_K = 3j - (m + r)$
4. Degree of Static indeterminacy is used in flexibility matrix method for finding size of the matrix.	4. Degree of Kinematic indeterminacy is used in Stiffness matrix method (or) Displacement method.

1b).



Rigid supports

Support Reactions r ⟶ 3 + 3 = 6

Joints j ⟶ 9

members m ⟶ 18.

Degree of Static indeterminacy $D_s = m + r - 2j$

$= (18) + 6 - 2(9)$

$= 18 + 6 - 18$

$D_s = 6$

$D_s = 6.$

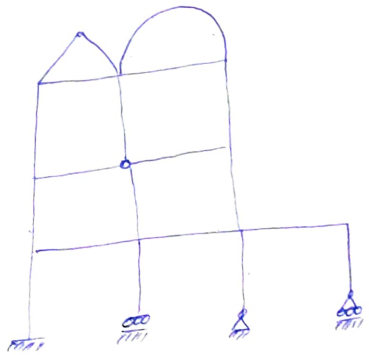
Degree of Kinematic indeterminacy

$D_K = 3j - (m + r)$

$= 3(9) - (18 + 6) = 27 - 18 - 6$

$= 27 - 24$

$D_K = 3.$



Support Reactions r ⟶ 3 + 2 + 3 + 1 = 9

Joints j ⟶ 10

members ⟶ 17

Degree of Static indeterminacy D_s

$= m + r - 2j$

$= 17 + 9 - (2 \times 10)$

$= 26 - 20 = 6.$

Degree of Static indeterminacy $D_s = 6.$

Degree of Kinematic indeterminacy $D_K = 3j - (m + r)$

$= (3 \times 10) - (17 + 9)$

$D_K = 30 - 23 = 7.$

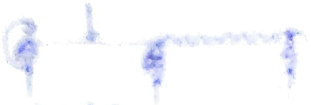
Step 1: Evaluation of Degree of static indeterminacy of the structure

$$D_s = (3 \times 3 - 3) - 3$$

$$= 9 - 6$$

$$D_s = 3$$

Step 2: Release structure



Step 3: Write the matrix form released structure and degree of static indeterminacy in 3×3 (or)

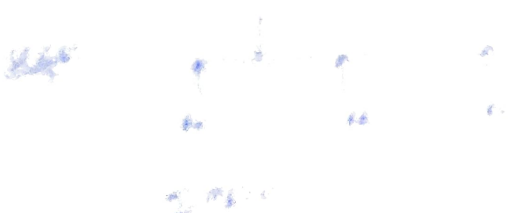
Step 4: Generate joint displacements

$$\delta L = \frac{w \times a \times b}{6 \times E \times L}(L + a)$$

$$\delta R = \frac{5 w L^4}{384 E I}$$

Step 5:

Step 6:



D.Hausa.

GokarajuRangaraju

Instituteof EngineeringandTechnology (Autonomous)

Department of Civil Engineering

I M.Tech. ISemester MID I EXAMINATION February-2022

Matrix Methods in Structural Engineering (GR20D5001)

Time: 15Minutes | **Dateofexamination:-07-02-2022 (FN)** | **Max.Marks : 5Marks**

Answerallquestions | **Allquestionscarryequalmarks** | **10 X 1/2=5Marks**

Name: Thola Harshavardhan

2	1	2	4	1	D	2	0	1	5

Choosethecorrectanswers.

1. The origin lies in natural co-ordinate system is _____ [D]
   A) At centreof element B) Any one side of element C) away from element D) Either A or B

2. The value of increases means the deformation leads to _____ [C]
   A)Increaes B) decreases C) Can't say D) Either A or B

3. The relation between Flexibility and Stiffness will be proportional to _____ [B]
   A) Directly B) Inverse C) Either A or B D) None of the above

4. The moment required to produce unit rotation when far end is hinged or simply supported [A]
   A) $\frac{2EI\theta}{L}$ B) $\frac{EI\theta}{L}$ C) $\frac{4EI\theta}{L}$ D) $\frac{6EI\theta}{L}$

5. The moment required to produce unit rotation when far end is fixed [A]
   A) $\frac{6EI\delta}{l^2}$ B) $\frac{3EI\delta}{l^2}$ C) $\frac{4EI\delta}{l^2}$ D) $\frac{EI\delta}{l^2}$

6 Which matrix method is suitable when DSI >KID [B]
   A) Flexibility Matrix method B)Stiffness matrix method
   C) Either A or B D) both are not suitable

7. If given structure dof is equals to 2, the size of stiffness matrix is equals to [A]
   A) 2 X 2 B) 1 X 1 C) 3 X 3 D) 2 x1

8. The number of redundants at hinged support will be equal to _____ [B]
   A) 1 B) 2 C) 3 D) Zero

9. The degree of freedom (dof) for fixed support will be equal to _____ [D]
   A) 1 B) 2 C) 3 D) Zero

10. The stiffness matrix method is also known as_____ [C]
   A) Flexibility matrix method B) Force method
   C) Displacement method D) Either A or B

Suraj

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Bachupally, Kukatpally, Hyderabad - 500090

I | II **MID TERM EXAMINATION**

No. 395179 H.T. No. 2 1 2 4 1 0 2 0 1 0

Name of the Examination I ~~mid~~ M. Tech 1st year 1st sem mid I Examination

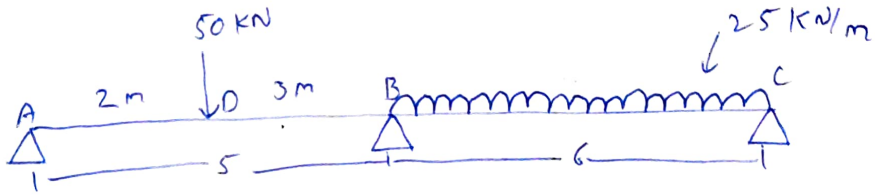
Course M. Tech. Branch Civil Date 07/02/2022

Signature of the Invigilator 7/2/22

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS					3								3

START WRITING FROM HERE

3) (a)



$l_1 = 5m$

$l_2 = 6m$

50KN Point load is acting from A to B

25 KN/m is acting on B to C

there are 2 points acting so it is 2x2 matrix.

$\delta l_1 = \frac{W}{12EIl}(l+a)^2$

$\delta l_2 = \frac{W l^2}{12EI}$

$$\delta_{1_1} = \frac{50}{12EI(5)}(5+2)$$

$$= \frac{50(7)}{60EI} = \frac{350}{60EI}$$

$$\delta_{1_1} = \frac{35}{6EI}$$

$$\delta_{1_2} = \frac{25(6)^2}{12EI} = \frac{25\times 36^3}{12EI} = \frac{75}{EI}$$

now for the F

$$F_{11} = \frac{w}{3EI} = \frac{50}{3EI}$$

$$F_{12} = \frac{w}{6EI} = \frac{50}{6EI}$$

$$F_{21} = \frac{w}{6EI} = \frac{25}{6EI}$$

$$F_{22} = \frac{w}{3EI} + \frac{w}{3EI}$$

$$= \frac{50}{3EI} + \frac{25}{3EI} = \frac{75}{3EI}$$

now matrix

$$[F][R] = [0] - [S1]$$

$$\begin{bmatrix} \frac{50}{3EI} & \frac{50}{6EI} \\ \frac{25}{6EI} & \frac{75}{3EI} \end{bmatrix} \begin{bmatrix} R_1 \\ R_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \end{bmatrix} - \begin{bmatrix} \frac{35}{6EI} \\ \frac{75}{EI} \end{bmatrix}$$

take $\frac{1}{EI}$ as common

$$\frac{1}{EI} \begin{bmatrix} \frac{50}{3} & \frac{50}{6} \\ \frac{25}{6} & \frac{75}{3} \end{bmatrix} \begin{bmatrix} R_1 \\ R_2 \end{bmatrix} = -\frac{1}{EI} \begin{bmatrix} \frac{35}{6} \\ 75 \end{bmatrix}$$

After solving this matrix we can get the R_1 & R_2 values.

$R_1 =$

$R_2 =$

Suraj

GokarajuRangaraju

Instituteof EngineeringandTechnology (Autonomous)

Department of Civil Engineering

I M.Tech. ISemester MID I EXAMINATION February-2022

Matrix Methods in Structural Engineering (GR20D5001)

Time: 15Minutes **Answerallquestions**

Dateofexamination:-07-02-2022 (FN) **Allquestionscarryequalmarks**

Max.Marks : 5Marks **10 X 1/2=5Marks**

Name: R.V. Suraj Reddy

2	1	2	4	1	D	2	0	1	O

Choosethecorrectanswers.

1. The origin lies in natural co-ordinate system is _____ [D]
   A) At centreof element B) Any one side of element C) away from element D) Either A or B

2. The value of increases means the deformation leads to _____ [C]
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   A) $\frac{2EI\theta}{L}$ B) $\frac{EI\theta}{L}$ C) $\frac{4EI\theta}{L}$ D) $\frac{6EI\theta}{L}$

5. The moment required to produce unit rotation when far end is fixed [A]
   A) $\frac{6EI\delta}{l^2}$ B) $\frac{3EI\delta}{l^2}$ C) $\frac{4EI\delta}{l^2}$ D) $\frac{EI\delta}{l^2}$

6 Which matrix method is suitable when DSI >KID [A]
   A) Flexibility Matrix method B)Stiffness matrix method
   C) Either A or B D) both are not suitable

7. If given structure dof is equals to 2, the size of stiffness matrix is equals to [A]
   A) 2 X 2 B) 1 X 1 C) 3 X 3 D) 2 x1

8. The number of redundants at hinged support will be equal to _____ [B]
   A) 1 B) 2 C) 3 D) Zero

9. The degree of freedom (dof) for fixed support will be equal to _____ [D]
   A) 1 B) 2 C) 3 D) Zero

10. The stiffness matrix method is also known as_____ [C]
   A) Flexibility matrix method B) Force method
   C) Displacement method D) Either A or B

Ashij

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Bachupally, Kukatpally, Hyderabad - 500090

I	II	MID TERM EXAMINATION

No. 419033

H.T. No.	2	1	2	4	1	D	2	0	0	9

Name of the Examination M Tech STE Civil - Mid-2 I-Year - I^st sem

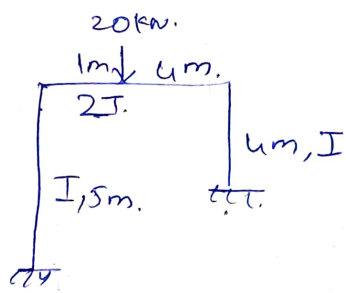
Course MMSA Branch STE (Civil) Date 14th March 2022

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS		3	4½		5								12½ / 15

START WRITING FROM HERE

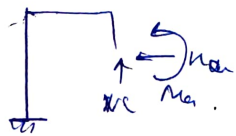
1. a. Force Method / Flexibility Matrix Method.



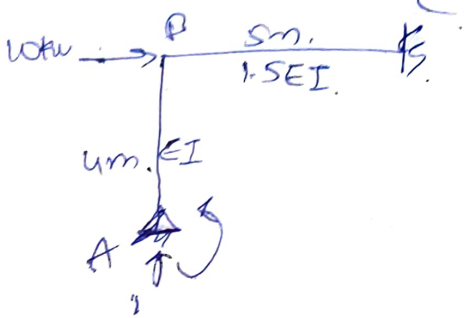
Step 1: $D_s = (3m + r) - 3j$

$= (3 \times 3 + 6) - 3 \times 4 = 3$

Step 2: Released structure with external loads.



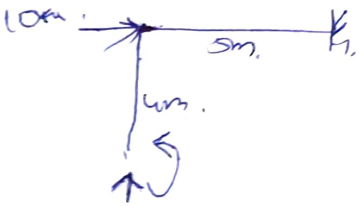
(b) Force Method / Flexibility matrix.



Step 1

$D_S = 2$.

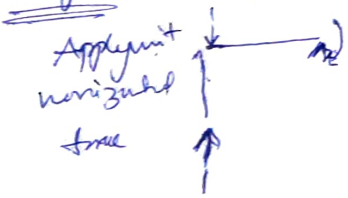
Step 2. Released structure. FBD.

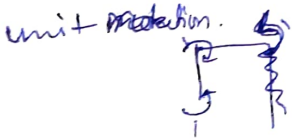


$M_b = 10 \times 4 = 40$ kN.m

$M_{Ra} = 0$ (Calculate no vertical loads).

Step 3 Apply unit load and evaluate the moments.





	M	m_1	m_2	Section	Limits	Origin
AB	-40	0	-1	I	0-4.	A
BC	[illegible]	[illegible]	-1	1.5I	0-5	B.

Step 4.: Evaluate joint displacements.

$$\delta_1 = \int \frac{M m_1}{EI} dx = \int_0^4 \frac{M m_1}{EI} dx + \int_0^5 \frac{M m_1}{EI} dx$$

$$\delta_2 = \int \frac{M m_2}{EI} dx = \int_0^4 \frac{M m_2}{EI} dx + \int_0^5 \frac{M m_2}{EI} dx$$

Step 5: Evaluate flexibility coefficients

$$f_{11} = \int \frac{m_1 m_1}{EI} dx = \int_0^4 \frac{m_1 m_1}{EI} dx + \int_0^5 \frac{m_1 m_1}{EI} dx$$

$$f_{12} = f_{21} = \int \frac{m_1 m_2}{EI} dx = 1.$$

$$f_{22} = \int \frac{m_2 m_2}{EI} dx$$

By $F = \begin{bmatrix} f_{11} & f_{21} \\ f_{12} & f_{22} \end{bmatrix}$

Step 6:

By using compatibility equations.

$$f_{11} P_1 + f_{21} P_2 = -\delta_1 \rightarrow (1)$$

$$f_{12} P_1 + f_{22} P_2 = -\delta_2 \rightarrow (2)$$

By solving (1) & (2)

P_1 & P_2 are known.

Step-7, BMD & SFD.

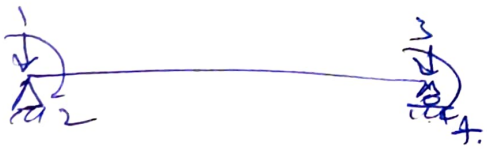
3a) Static condensation.

In static condensation the unknown displacements are kept at the top of the displacement matrix.

The rows are rearranged as known at the bottom and unknown at the top. similarly the stiffness matrix also changes. $[k^*]$

Let us consider simply supported beam.

$D_k = 4$



Size of the matrix is 4 X 4 since kinematic indeterminacy is 4.

- To get 1st column of stiffness matrix

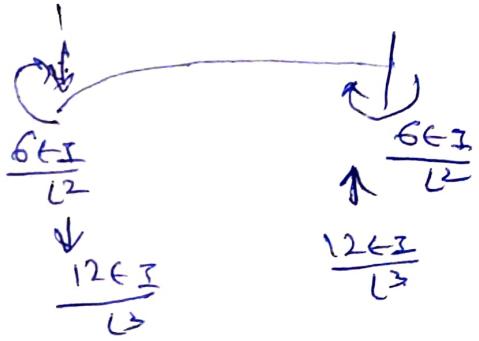
Apply unit load on 1.

$K_{11} = \frac{12EI}{L^3}$

$K_{21} = +\frac{6EI}{L^2}$

$K_{31} = -\frac{12EI}{L^3}$

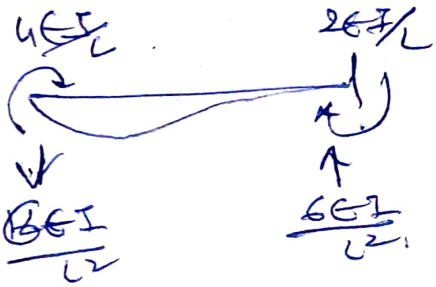
$K_{41} = \frac{6EI}{L^2}$



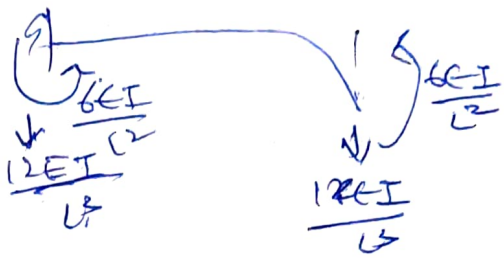
Apply unit rotation along 2.

$K_{21} = \frac{6EI}{L^2}$ $K_{32} = -\frac{6EI}{L^2}$

$K_{22} = \frac{4EI}{L}$ $K_{42} = \frac{2EI}{L}$



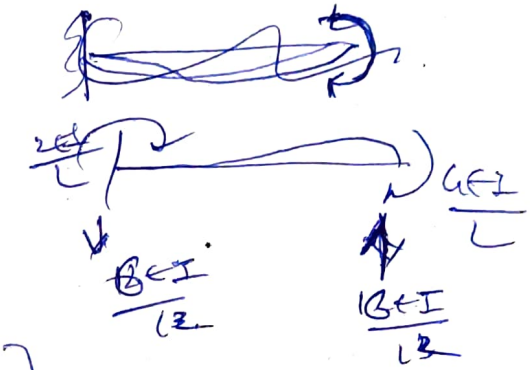
Apply unit load along 3.



$k_{BB} = \frac{12EI}{L^3}$ $\quad k_{33} = \frac{12EI}{L^3}$

$k_{23} = -\frac{6EI}{L^2}$ $\quad k_{43} = -\frac{6EI}{L^2}$

Apply unit rotation along 4.



$k_{44} = \frac{6EI}{L^2}$ $\quad k_{34} = -\frac{6EI}{L^2}$

$k_{24} = \frac{2EI}{L}$ $\quad k_{44} = \frac{4EI}{L}$

$$K = \begin{matrix} \\ 1 \\ 2 \\ 3 \\ 4 \end{matrix} \begin{matrix} \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{bmatrix} \frac{12EI}{L^3} & \frac{6EI}{L^2} & \frac{12EI}{L^3} & \frac{6EI}{L^2} \\ \frac{6EI}{L^2} & \frac{4EI}{L} & -\frac{6EI}{L^2} & \frac{2EI}{L} \\ \frac{12EI}{L^3} & -\frac{6EI}{L^2} & \frac{12EI}{L^3} & -\frac{6EI}{L^2} \\ \frac{6EI}{L^2} & \frac{2EI}{L} & -\frac{6EI}{L^2} & \frac{4EI}{L} \end{bmatrix} \end{matrix}$$

∴ It is transpose, Symmetrix & Square

$$\delta = \begin{Bmatrix} \Delta_1 \\ \Delta_2 \\ \Delta_3 \\ \Delta_4 \end{Bmatrix} \quad \& \quad P = \begin{Bmatrix} P_1 \\ P_2 \\ P_3 \\ P_4 \end{Bmatrix}$$

We know that Δ_1 & Δ_3 are zeros by rearranging the matrix as known at the bottom and unknown at the top. we get $[k]\{\delta\}$ as.

$$\begin{matrix} \frac{6EI}{L^2} & \frac{6EI}{L^2} & \frac{12EI}{L^3} & \frac{12EI}{L^2} \end{matrix}$$

$$\begin{array}{c} \\ 2 \\ 4 \\ 1 \\ 3 \end{array}\begin{bmatrix} \frac{6EI}{L^2} & \frac{4EI}{L} & -\frac{6EI}{L^2} & \frac{2EI}{L} \\ \frac{6EI}{L^2} & \frac{2EI}{L} & -\frac{6EI}{L^2} & \frac{4EI}{L} \\ \frac{12EI}{L^3} & \frac{6EI}{L^2} & \frac{12EI}{L^3} & \frac{6EI}{L^2} \\ \frac{12EI}{L^3} & -\frac{6EI}{L^2} & \frac{12EI}{L^3} & -\frac{6EI}{L^2} \end{bmatrix} \begin{Bmatrix} \Delta_2 \\ \Delta_4 \\ \Delta_1 \\ \Delta_3 \end{Bmatrix}$$

rearranging columns.

$$\begin{array}{c} \\ 2 \\ 4 \\ 1 \\ 3 \end{array}\left[\begin{array}{cc|cc} \frac{4EI}{L} & \frac{2EI}{L} & \frac{6EI}{L^2} & -\frac{6EI}{L^2} \\ \frac{2EI}{L} & \frac{4EI}{L} & \frac{6EI}{L^2} & -\frac{6EI}{L^2} \\ \hline \frac{6EI}{L^2} & \frac{6EI}{L^2} & \frac{12EI}{L^3} & \frac{12EI}{L^3} \\ -\frac{6EI}{L^2} & -\frac{6EI}{L^2} & \frac{12EI}{L^3} & \frac{12EI}{L^3} \end{array}\right] \begin{Bmatrix} \Delta_2 \\ \Delta_4 \\ \Delta_1 \\ \Delta_3 \end{Bmatrix} = \begin{Bmatrix} P_4 \\ P_2 \\ P_1 \\ P_3 \end{Bmatrix}$$

K_{11} K_{12} K_{21} K_{22} δ_1 δ_2 P_1 P_2

The matrix can be written in form as shown:

$$\begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix} \begin{Bmatrix} \delta_1 \\ \delta_2 \end{Bmatrix} = \begin{Bmatrix} P_1 \\ P_2 \end{Bmatrix}$$

By using equilibrium equations.

$$[K_{11}]\{\delta_1\} + [K_{12}]\{\delta_2\} = -P_1 \quad \rightarrow (1)$$

$$[K_{21}]\{\delta_1\} + [K_{22}]\{\delta_2\} = -P_2 = 0. \rightarrow (2)$$

W.K.T. $P_2 = 0$, $\delta_2 = 0$.

$\therefore [K_{12}]\{\delta_2\} = 0$, $[K_{22}]\{\delta_2\} = 0$.

Consider eq ②.

$$[k_{21}]\{\delta_1\} = -[k_{22}]\{\delta_2\}$$

$$\{\delta_2\} = -[k_{22}]^{-1}[k_{21}]\{\delta_1\} \rightarrow ⓐ$$

Sub ⓐ in eqn ①

$$[k_{11}]\{\delta_1\} + [k_{12}]\left[-[k_{22}]^{-1}[k_{21}]\{\delta_1\}\right] = P_1$$

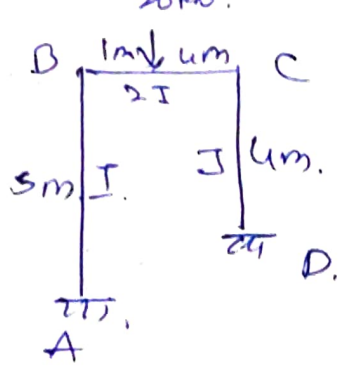
$$\{\delta_1\}\underbrace{\left[[k_{11}] - [k_{12}][k_{22}]^{-1}[k_{21}]\right]}_{[k^*]} = P.$$

$[k^*]$ – Static condensation matrix

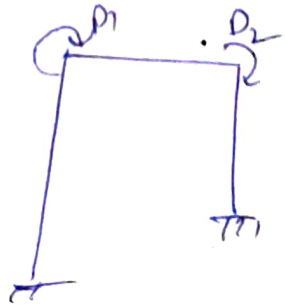
2. a) Displacement Method./ Stiffness Matrix method

Step: 1 Unsymmetric frame

$D_k = 2$, size of the matrix is 2×2.



Step: 2. : Released structure



Step 3: Evaluate FEMs ~~fixed end moments~~.

$\bar{m}_{ab} = \bar{m}_{ba} = \bar{m}_{cd} = \bar{m}_{dc} = 0$ (Since no loads are acting)

$$\bar{m}_{bc} = -\frac{Wab^2}{L^2} = -12.8\ kNm.$$

$$\bar{m}_{cb} = \frac{+Wb^2a^2}{L^2} = 3.2\ kNm$$

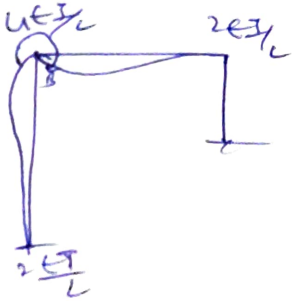
3 Joint loads

$P_1 = 0 - 12.8 = -12.8 \text{ kN m}$.

$P_2 = 0 + 8.2 = 3.2 \text{ kN m}$.

Step 4: Evaluate stiffness coefficients

Apply unit rotation along B to get 1st column

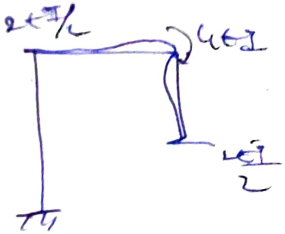


$$k_{11} = \left(\frac{4EI}{L}\right)_{ab} + \left(\frac{4EI}{L}\right)_{bc}$$

$$= \frac{4EI}{5} + \left(\frac{4 \times E \times 2I}{5}\right) = 2.4EI$$

$$k_{21} = \left(\frac{2EI}{L}\right)_{bc} = \frac{2 \times 2I \times E}{5} = 0.8EI$$

Apply unit rotation along C



$$k_{22} = \left(\frac{4EI}{L}\right)_{ab} + \left(\frac{4EI}{L}\right)_{cd}$$

$$= \left(\frac{4 \times 2E \times I}{5}\right) + \left(\frac{4 \times E \times I}{4}\right) = 2.6EI$$

$$k_{12} = \frac{2EI}{L} = \frac{2 \times 2 \times EI}{5} = 0.8EI.$$

$$\therefore \quad k = EI \begin{bmatrix} 2.4 & 0.8 \\ 0.8 & 2.6 \end{bmatrix}$$

By using equilibrium equations.

$$k_{11}\delta_1 + k_{12}\delta_2 = -P_1$$

$$k_{21}\delta_1 + k_{22}\delta_2 = -P_2$$

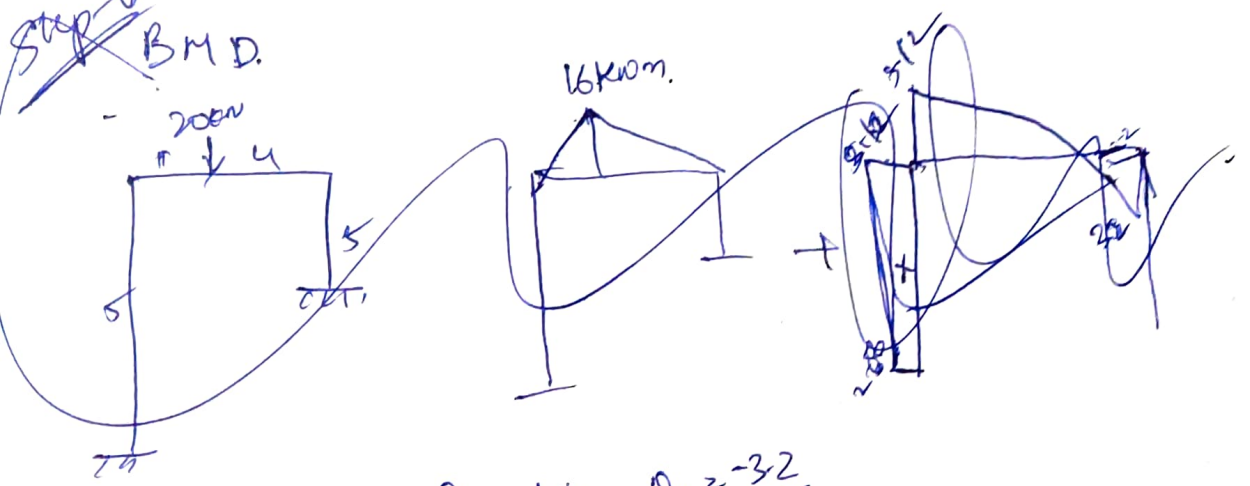
$$2.4\,\theta_1 + 0.8\,\theta_2 = -(-12\theta)$$

$$0.8\,\theta_1 + 0.6\,\theta_2 = -3.2$$

$$\theta_1 = \frac{6.4}{EI}\ \text{radian} \qquad \theta_2 = -3.2\ \text{radian}.$$

Step-6.

BMD.



$$\theta_b = \frac{6.4}{EI}, \quad \theta_c = \frac{-3.2}{EI}.$$

Step-5

$$M_{ab} = \bar{M}_{ab} + \left(\frac{2EI}{5}\right)_{ab}(2\theta_a + \theta_b) = 2.56\ \text{kNm}.$$

$$M_{ba} = \bar{M}_{ba} + \left(\frac{2EI}{5}\right)_{ba}(2\theta_b + \theta_a) = 5.12\ \text{kNm}.$$

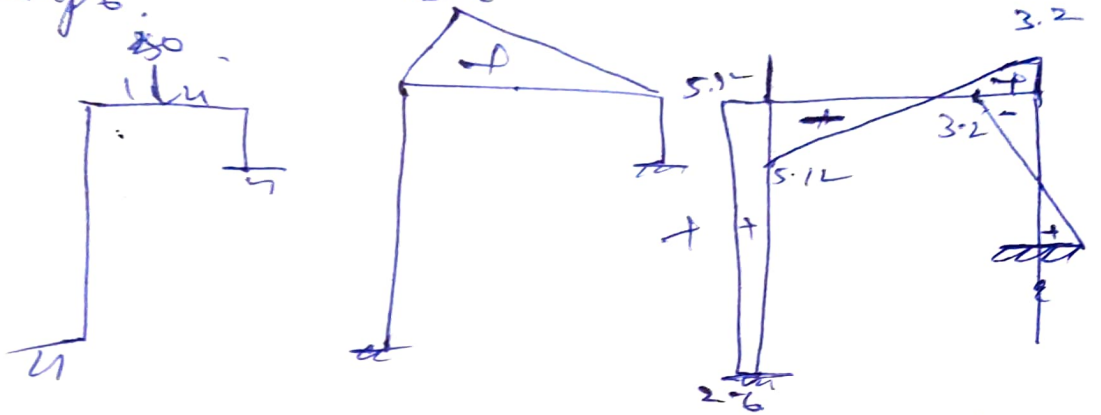
$$M_{bc} = \bar{M}_{bc} + \left(\frac{2EI}{5}\right)_{bc}(2\theta_b + \theta_c) = -5.12\ \text{kNm}.$$

$$M_{cb} = \bar{M}_{cb} + \left(\frac{2EI}{5}\right)_{cb}(2\theta_c + \theta_b) = 3.2\ \text{kNm}$$

$$M_{cd} = \bar{M}_{cd} + \left(\frac{2EI}{4}\right)_{cd}(2\theta_c + \theta_d) = -3.2\ \text{kNm}.$$

$$M_{dc} = \bar{M}_{dc} + \left(\frac{2EI}{4}\right)_{dc}(2\theta_d + \theta_c) = 1.6\ \text{kNm}.$$

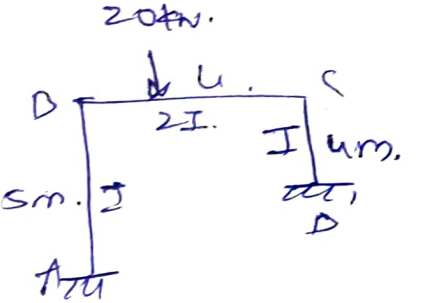
Step 6. wcp = 16t. BMD.



Flexibility matrix method.

1a. Step: I

$D_S = 3$

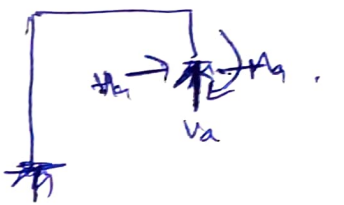


Step-2. Released structure.

$M_d = 20kN.$

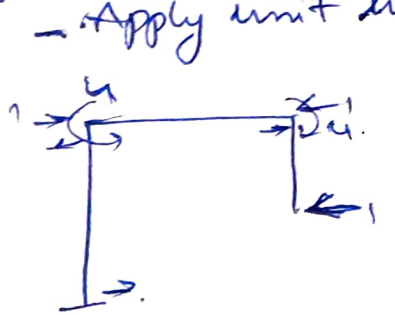
$M_d = 80kN.$

$H_a = 0$ (horizontal)

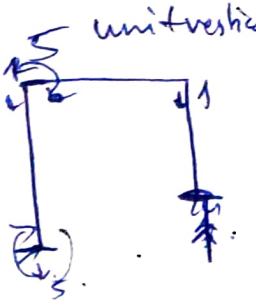


Step: 3.

- Apply unit horizonal force.



unit vertical force



Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous) Department of Civil Engineering
I M.Tech. I Semester MID II EXAMINATION March--2022

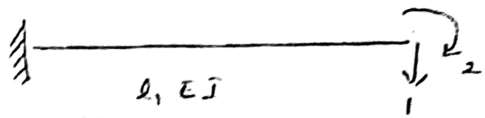
Matrix Methods in Structural Engineering (GR20D5001)

Time: 15 Minutes **Date of examination 14-03--202**
Max.Marks: 5 Marks

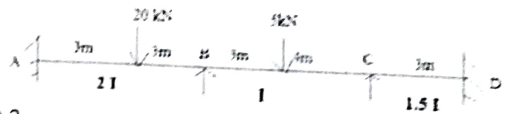
$10 \times \frac{1}{2} = 5$ Marks

Name : M. Pranav. Roll No. 21 2U 1 D 2008

1. Match the following from the following for coefficient of f_{12} = [C]
   a) $\int_0^x \frac{m_1 m_1}{EI}$ b) $\int_0^x \frac{m_1 m}{EI}$ c) $\int_0^x \frac{m_1 m_2}{EI}$ d) $\int_0^x \frac{m}{EI}$
2. The number reactive force at fixed end support will be [B]
   a) 3 b) 2 c) 1 d) 0
3. As per stiffness matrix the co-efficient of k_{ij} = [B]
   a) k_{ij} b) k_{ji} c) f_{ij} d) f_{ji}
4. Determine the co-efficient k_{12} for the given dof's [A]



   a) $\frac{6EI}{l^2}$ b) $\frac{12EI}{l^3}$ c) $-\frac{12EI}{l^3}$ d) $-\frac{6EI}{l^2}$
5. Determine the co-efficient k_{22} for the given dof's [A]
   a) $\frac{6EI}{l^2}$ b) $\frac{12EI}{l^3}$ c) $-\frac{12EI}{l^3}$ d) $\frac{4EI}{l}$
6. What is the dof for the given continuous beam [B]



   a) 3 b) 2 c) 1 d) 0
7. Estimate the relative stiffness for the member if far end is hinged [A]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
8. Estimate the relative stiffness for the member if far end is fixed [B]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
9. In static condensation the unknown displacements kept at __of displacement matrix [A]
   a) Top b) Centre c) Bottom d) Any where
10. The temperature stresses are increased when boundaries are _____ [D]
   b) Free b) clamped c) Fixed d) Both b & C

Gokaraju Rangaraju Institute of Engineering & Technology

(Autonomous College Affiliated to JNTUH) (12 Pages)

Bachupally, Kukatpally, Hyderabad - 500090

I	II	MID TERM EXAMINATION

No. 419035

H.T. No.	2	1	2	4	1	D	2	0	1	1

Name of the Examination MMSA Mid-I

Course M-Tech 1st year Branch Civil Date 14/03/2022.

14.3.22

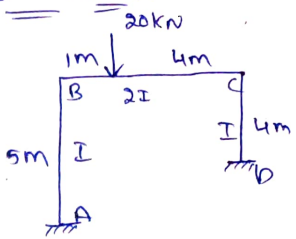
Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	1½		3½			0							5/15

START WRITING FROM HERE

(2A)

given data :-



Step-I

kinmatic of displacement is 2

Step-2

Calculate the moments on the each joint

$M_{ab} = m_{ba} = 0$

$m_{bc} = -\frac{wab^2}{l^2} - \frac{wa^2b}{l^2}$

$= -\frac{20(4)^2}{5^2} - \frac{20(4)(1)^2}{5^2} = -16 kN$

$$m_{cb} = \frac{wab^2}{L^2} + \frac{wa^2b}{L^2}$$

$$= \frac{20(1)(4)^2}{5^2} + \frac{20(1)^2(4)}{5^2}$$

$$= 16 \text{ kn/m}$$

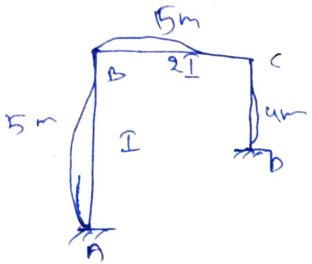
$$m_{cd} = m_{dc} = 0$$

$$P_1 = -16 \text{ kn/m}$$

$$P_2 = 16 \text{ kn/m}$$

Step-3

Calculation of Stiffness matrix



$$K_{11} = \frac{4EI}{l}$$

$$= \frac{4EI(1)}{5}$$

$$K_{11} = \frac{4}{5} EI$$

$$K_{21} = \frac{2EI}{l} + \frac{2EI}{l}$$

$$K_{21} = 2EI$$

$$K_{12} = \frac{4EI}{l}$$

$$= \frac{4}{5} EI$$

$$k_{21} = \frac{2EI}{L} + \frac{2EI}{L}$$

$$= \frac{2(2)}{5} + \frac{2(1)}{4}$$

k_{21} 1.3 EI

Step-4

Calculation of kinmatic equation

$$k_{11} D_1 + k_{21} D_2 + R = 0$$

$$\frac{4}{3}E + 2 + (-16) = 0 \longrightarrow (1)$$

$$k_{12} D_1 + k_{22} D_2 + P_2$$

$$\frac{4}{3}EI + 1.3EI + 16 = 0 \longrightarrow (2)$$

$$\theta_A = 56.57 \text{ mm}$$

$$\theta_B = -45.71 \text{ mm}$$

Step-5

Calculation of moment on the

$$M_{ab} = m_{ab} + \frac{4EI}{L}[2\times\theta_A + 2\times\theta_B]$$

$$= 0 + \frac{4EI}{5}(2\times 56.57 + 2\times -45.71)$$

$M_{ab} = 17.288$ mm

$\bar{m}_{ba} = $ ~~$m_{ba} + \frac{4EI}{L}(2\theta_A)$~~ -17.243

$\bar{m}_{bc} = m_{bc} + \frac{4EI}{L}(2\times\theta_A + 2\times\theta_B)$

$= -16 + \frac{4(2)}{5}(2\times 56.67 + 2\times -45.71)$

$= 19.092$ mm

$\bar{m}_{cb} = 16 + \frac{4(2)}{5}(2\times 56.67 + 2\times -45.71)$

$= 51.092$ mm

$m_{cd} = m_{cd} + \frac{4EI}{L}(2\times\theta_A + 2\times\theta_B)$

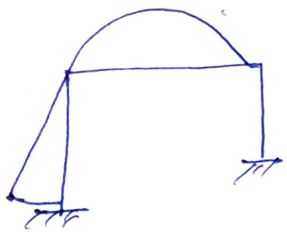
$= 0 + \frac{4(I)}{4}(2\times 56.67 + 2\times -45.71)$

$m_{cd} = 21.92$ kN

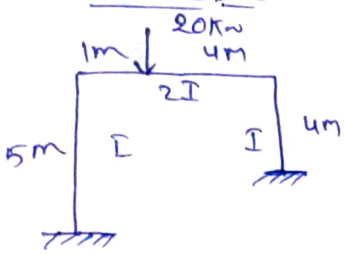
$m_{dc} = $ ~~$m_{dc} + \frac{4}{L}$~~ 21.92 kN

Step-6

BMD



(11) given Data

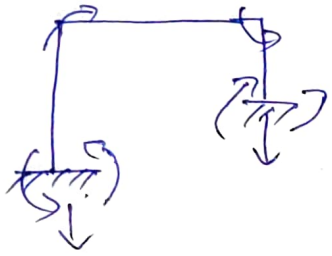


Step-I

$D_K = (3m+r) - j$

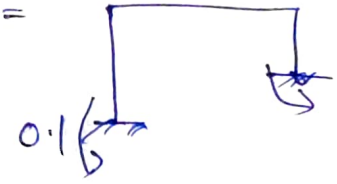
$= (3(3)+6) - 4$

$D_K = 11$

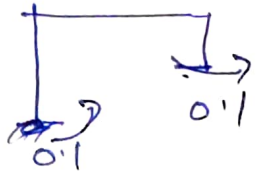


Step-II

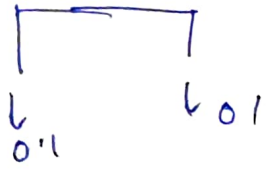
vertical reaction =



Horizontal reaction



Central reaction

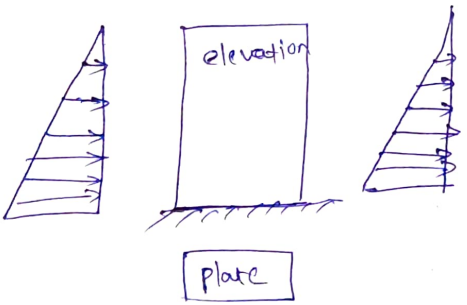


Mt 3(b) The methods of analysis of shear wall

The shear walls are consists of reniforce concrete wall that can be used by beams, colums and slabs to the structure which can be formed by high-rise buildings

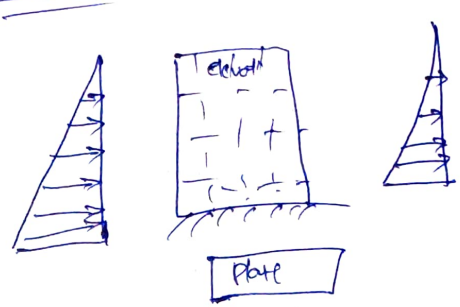
This shear walls are used to construct the high-rise buildins of resistance of earthquess

Thin shear walls :



$\frac{1}{2} \times D \times$

Cantilever Shear wall



3(b) effect due to thermal stress in structure :-

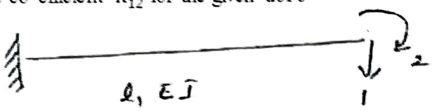
Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous) Department of Civil Engineering
I M.Tech. I Semester MID II EXAMINATION March--2022

Matrix Methods in Structural Engineering (GR20D5001)

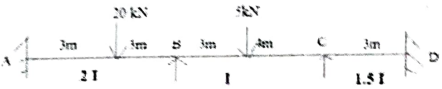
Time: 15 Minutes | Date of examination 14-03--202
Max.Marks: 5 Marks | $10 \times \frac{1}{2} = 5$ Marks

Name : R. Mohan baba | Roll No. 2 1 2 4 1 D 2 0 1 1

1. Match the following from the following for coefficient of f_{12} = [c]
   a) $\int_0^x \frac{m_1 m_1}{EI}$ b) $\int_0^x \frac{m_1 m}{EI}$ c) $\int_0^x \frac{m_1 m_2}{EI}$ d) $\int_0^x \frac{m}{EI}$
2. The number reactive force at fixed end support will be [a]
   a) 3 b) 2 c) 1 d) 0
3. As per stiffness matrix the co-efficient of k_{ij} = [a]
   a) k_{ij} b) k_{ji} c) f_{ij} d) f_{ji}
4. Determine the co-efficient k_{12} for the given dof's [d]



   a) $\frac{6EI}{l^2}$ b) $\frac{12EI}{l^3}$ c) $-\frac{12EI}{l^3}$ d) $-\frac{6EI}{l^2}$
5. Determine the co-efficient k_{22} for the given dof's [a]
   a) $\frac{6EI}{l^2}$ b) $\frac{12EI}{l^3}$ c) $-\frac{12EI}{l^3}$ d) $\frac{4EI}{l}$
6. What is the dof for the given continuous beam [b]



   a) 3 b) 2 c) 1 d) 0
7. Estimate the relative stiffness for the member if far end is hinged [a]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
8. Estimate the relative stiffness for the member if far end is fixed [b]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
9. In static condensation the unknown displacements kept at __of displacement matrix [a]
   a) Top b) Centre c) Bottom d) Any where
10. The temperature stresses are increased when boundaries are _____ [d]
   b) Free b) clamped c) Fixed d) Both b & C

Gokaraju Rangaraju Institute of Engineering & Technology

(Autonomous College Affiliated to JNTUH)

Bachupally, Kukatpally, Hyderabad - 500090

I | II **MID TERM EXAMINATION**

No. 413031

H.T. No. 2 1 2 4 1 D 3 0 1 0

Name of the Examination M. Tech 1st year 1st Sem, mid 2 Examinations

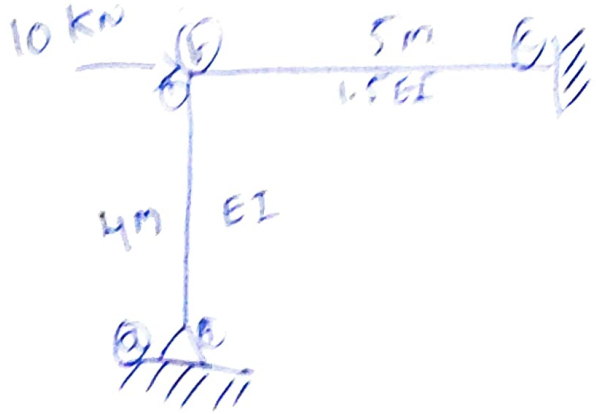
Course MMSE Branch Civil Date 14/03/24

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	13	1											14

START WRITING FROM HERE

1) (a)



$D_K = 2$

$D_1 =$

$D_2 =$

$$\bar{M}_{ab} = -\frac{6EI}{l^2} = \frac{6EI}{(4)^2} = \frac{36EI}{16} = -\frac{3}{8}EI$$

$$\bar{M}_{ba} = +\frac{6EI}{l^2} = \frac{3}{8}EI$$

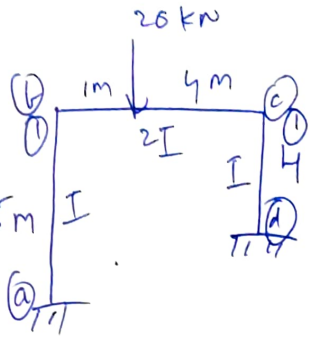
$$\bar{M}_{bc} = \frac{4EI}{l} = \frac{4 \times 1.5EI}{l} = \frac{6EI}{5}$$

$$\bar{M}_{cb} = \frac{6EI}{l^2} = \frac{6 \times 1.5EI}{(5^2)} = \frac{9EI}{25} \quad \frac{9}{25}EI$$

$$\Rightarrow \begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix} = EI \begin{bmatrix} -\frac{3}{8} & \frac{3}{8} \\ \frac{6}{5} & \frac{9}{25} \end{bmatrix} \begin{bmatrix} D_1 \\ D_2 \end{bmatrix}$$

1)

(a)



$D_K = 2$

Acting at b, c

there fore its = 2 X 2 matrix

joint loads

$P_1 = 0 - 12.8 = -12.8\,kN$

$P_2 = 0 + 3.2 = 3.2\,kN$

$$k_{11} = \left(\frac{4EI}{l}\right)_{ab} + \left(\frac{4EI}{l}\right)_{bc} = 2.4\,EI$$

$$= \frac{4}{5}EI + \frac{8}{5}EI = 2.4\,EI$$

$$k_{21} = \left(\frac{2EI}{l}\right)_{bc} = \frac{4}{5}EI = 0.8\,EI$$

$$k_{22} = \left(\frac{4EI}{l}\right) + \left(\frac{4EI}{l}\right)_{cd}$$

$$= 2.6\,EI$$

$$k_{12} = \frac{2EI}{l} = \frac{2 \times 2 \times 0.2}{5} = 0.8\,EI$$

$$\therefore K = EI \begin{bmatrix} 2.4 & 0.8 \\ 0.8 & 2.6 \end{bmatrix}$$

Suraj

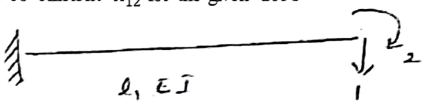
Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous) Department of Civil Engineering
I M.Tech. I Semester MID II EXAMINATION March--2022

Matrix Methods in Structural Engineering (GR20D5001)

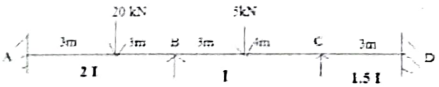
Time: 15 Minutes **Date of examination 14-03--202**
Max.Marks: 5 Marks $10 \times \frac{1}{2} = 5$ Marks

Name : P.V. Suraj Reddy Roll No. 2 1 2 4 1 D 2 0 1 0

1. Match the following from the following for coefficient of f_{12} = [C]
   a) $\int_0^x \frac{m_1 m_1}{EI}$ b) $\int_0^x \frac{m_1 m}{EI}$ c) $\int_0^x \frac{m_1 m_2}{EI}$ d) $\int_0^x \frac{m}{EI}$
2. The number reactive force at fixed end support will be [A]
   a) 3 b) 2 c) 1 d) 0
3. As per stiffness matrix the co-efficient of k_{ij} = [A]
   a) k_{ij} b) k_{ji} c) f_{ij} d) f_{ji}
4. Determine the co-efficient k_{12} for the given dof's [D]



   a) $\frac{6\,EI}{l^2}$ b) $\frac{12\,EI}{l^3}$ c) $-\frac{12\,EI}{l^3}$ d) $-\frac{6\,EI}{l^2}$
5. Determine the co-efficient k_{22} for the given dof's [D]
   a) $\frac{6\,EI}{l^2}$ b) $\frac{12\,EI}{l^3}$ c) $-\frac{12\,EI}{l^3}$ d) $\frac{4\,EI}{l}$
6. What is the dof for the given continuous beam [A]



   a) 3 b) 2 c) 1 d) 0
7. Estimate the relative stiffness for the member if far end is hinged [C]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
8. Estimate the relative stiffness for the member if far end is fixed [B]
   a) $\frac{I}{L}$ b) $0.5\frac{I}{L}$ c) $0.75\frac{I}{L}$ d) $2\frac{I}{L}$
9. In static condensation the unknown displacements kept at __of displacement matrix [A]
   a) Top b) Centre c) Bottom d) Any where
10. The temperature stresses are increased when boundaries are _____ [D]
    b) Free b) clamped c) Fixed d) Both b & C