Structural Analysis I

(GR20A2018)

II B. Tech II Semester

(2021-22 AY)

Mrs K Hemalatha

Assistant Professor

Department of Civil Engineering

Gokaraju Rangaraju Institute of Engineering and Technology

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

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering Structural Analysis

COURSE FILE CHECK LIST

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TIME TABLE

	1	2	3	4	5	6	7	8
Mon						SA I (12 to 1:55 PM)		
Tues								
Wed								
Thurs								
Fri							SA I (12:55 to 2:45)	
Sat	SA I (9 to 10:30 AM)							

CODE	Subject	Faculty
GR20A2018	Structural Analysis	Mrs K Hemalatha

CLASS COORDINATOR **PROGRAMME COORDINATOR** **HOD**

Unit I: Energy Theorems: Introduction – strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castiglione's first theorem – Deflections of simple beams and pin jointed trusses (Use Unit load method)

Unit II: Arches: Classification of arches, advantage of arch, three and two hinged arches – Circular and parabolic arches yielding of supports, Effect of rib shortening, Effect of temperature changes, Tied and linear arch, Eddy's theorem.

Unit III: Indeterminate Beams (Force Method) a. Propped cantilevers b. Fixed beams c. Continuous Beams (By Clapeyrons's theorem of three moments).

Unit IV: Analysis of Simple and Continuous Beams (Indeterminate Structures) (up to 2 nd degree of Static in-determinacy) a. Slope Deflection method b. Moment Distribution method c. Kani's Method.

Unit V: Moving Loads and Influence Line Diagrams: Introduction, maximum SF and BM at a given section and absolute maximum S.F and B.M due to single concentrated load, U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads – Equivalent uniformly distributed load – focal length.
Definition of influence line for SF, Influence line for B.M- load position for maximum SF at a section –Load positions for maximum BM at a section – Point loads , UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Text books:

1. Analysis of structures –vol I & vol II by V.N.Vazirani & M.M.Ratwani, Khanna Publicatios, New Delhi.
2. Analysis of structures by T.S.Thandavamoorthy, Oxford University Press, New Delhi.
3. Analysis of structures by S.S.Bhavkatti – Vikas Publishing House.

Reference Books:

1. Mechanics of Structures by S.B. Junnakar, Charotar Publishing House, Anand, Gujarat,
2. Theory of Structures by Pandit & Gupta Tata mc.Graw-Hill Publishing Co.Ltd., NewDelhi.
3. Theory of Structures by R.S.Khurmi, S. Chand Publishers.
4. Strength of Materials and Mechanics of Suctures by B.C.Punmia, Khanna publications.

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Department of Civil Engineering

PEOs

1. Graduates of the program will be successful in technical and professional career of varied sectors of Civil Engineering.
2. Graduates of the program will have proficiency to analyse and design real time Civil Engineering projects.
3. Graduates of the program will exhibit management and leadership qualities with good communication skills facilitating to work in a multidisciplinary team.
4. Graduates of the program will continue to engage in life-long learning with ethical and social responsibility

POs

a. Apply knowledge of mathematics, science and fundamentals of Civil Engineering.
b. Analyse problem and interpret the data.
c. Design a system component, or process to meet desired needs in Civil Engineering within realistic constraints.
d. Identify, formulate, analyse and interpret data to solve Civil Engineering problems.
e. Use modern engineering tools such as CAD and GIS for the Civil Engineering practice.
f. Understand the impact of engineering solutions in a global, economic and societal context.
g. Understand the effect of Civil Engineering solutions on environment and to demonstrate the need for sustainable development.
h. Understanding of professional and ethical responsibility.
i. Work effectively as an individual or in a team and to function on multi-disciplinary context.
j. Communicate effectively with engineering community and society.
k. Demonstrate the management principles in Civil Engineering projects.
l. Recognize the need for and an ability to engage in life-long learning.

PSOs

1. Recognize the need for a sustainable environment and design smart infrastructure considering the global challenges.
2. Create and develop innovative designs with new era materials through research and development.

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COURSE OBJECTIVES

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

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

S.No	Course Objectives
1	Skill to Estimate the deflections of simple beams and pin-jointed trusses using energy theorems.
2	Ability to analyze three and two hinged, circular and parabolic arches.
3	Knowledge to Analyze statically in-determinate structures using force and displacement methods.
4	To understand the effect of moving loads and analyze indeterminate beams and trusses.
5.	To understand the effect using influence diagrams in analysis of beams and trusses

Signature of HOD

Date:

Signature of faculty

Date:

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COURSE OUTCOMES

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

The expected outcomes of the Course/Subject are:

S.No	Course Outcomes
1	Determine deflections of beams and trusses using energy methods
2	Analyze three and two hinged, circular and parabolic arches.
3	Analyze indeterminate beams using force method for propped cantilever, fixed and Continuous beams (Clappeyron's three moment theorem).
4	Apply Slope deflection, Moment distribution and Kani's methods to analyze statically indeterminate structures.
5	Analyze statically determinate and indeterminate structures using rolling load and influence line method.

Signature of HOD

Date:

Signature of faculty

Date:

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Bachupally, Nizampet Road, Kukatpally, Hyderabad-500009

B.Tech CIVIL Engg. II Yr-II Sem- Section A- GR20 2021-22

S.No	Reg No	Student Name
1	20241A0101	Aadhi Srikar Rao
2	20241A0102	Abhiram Sai Yadav Jangiti
3	20241A0103	Bacchugudam Rithvik Reddy
4	20241A0104	Bandla Naveen
5	20241A0105	B.Pranav Sai
6	20241A0106	Bhattu Supreeth Chakravarthy
7	20241A0107	Bhupathiraju Himanthavarma
8	20241A0108	Boini Hemanth
9	20241A0109	Challa Ajay Kumar
10	20241A0110	Donaboina Sri Hari
11	20241A0111	Eppa Arnav
12	20241A0112	G L N Raghuraman
13	20241A0113	Gandla Harshith Kumar
14	20241A0114	Guggilla Shashank
15	20241A0115	Gunda Srikanth
16	20241A0116	Jangili Sravan Kumar
17	20241A0117	Janjirala Sruthi
18	20241A0118	Jarapula Jayanth
19	20241A0119	K Nikhitha
20	20241A0120	K Sanjeev Kumar
22	20241A0122	K.Kondal
22	20241A0122	Kammampati Udaykiran
23	20241A0123	Karne Srithan
24	20241A0124	Kunchala Varun Kumar
25	20241A0125	Kunta Nithin Reddy
26	20241A0126	M Pavan Kalyan
27	20241A0127	Mere Mahesh
28	20241A0128	Mohammed Ahmed
29	20241A0129	Mothukuri Laxman
30	20241A0130	Mottadi Aditya Teja
31	20241A0131	Mula Sushma Sri
32	20241A0132	Nayini Swetha
33	20241A0133	Paidipally Bharath
34	20241A0134	P.Sai Kiran Reddy
35	20241A0135	Pasnoor Pavan Prathap Reddy
36	20241A0136	Pathlavath Shiva Nayak
37	20241A0137	Peddiboina Anusha
38	20241A0138	Poreddy Abhinav Reddy
39	20241A0139	Pullagura Santhosh
40	20241A0140	Rachala Bharath
41	20241A0141	Radharapu Shaji Kumar

42	20241A0142	Ramavath Roja
43	20241A0143	Rathlavath Sairam Nayak
44	20241A0144	Ravi Teja Pasunuthi
45	20241A0146	Saddi Shriank Reddy
46	20241A0147	Sathvika Narla
47	20241A0148	Sokkula Koushikreddy
48	20241A0149	Sriram Pandavula
49	20241A0150	T.Bhargavi
50	20241A0151	T.Bhuvaneshwari
51	20241A0152	S.Teja Retiesh Reddy
52	20241A0153	Tejavath Kalyani
53	20241A0154	Tellapuram Prudhvi Raj
54	20241A0155	Thadem Rohith
55	20241A0156	Thummala Rajashekar
56	20241A0157	Uvsgr Kameswara Sai Karthik
57	20241A0158	Sreeram Vattem
58	20241A0159	V Vikesh
59	20241A0160	Vennam Srikar
60	22245A0101	Gumadavelli Arun Kumar
61	22245A0102	Kadirabad Sriram
62	22245A0103	Manikonda Nikitha
63	22245A0104	Paridula Prathyusha
64	22245A0105	Pateru Mouna

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GUIDELINES TO STUDY THE COURSE / SUBJECT

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. 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

Signature of HOD
Date:

Signature of faculty
Date:

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COURSE SCHEDULE

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. Of Periods
		From	To	
1.	Unit -I Energy Theorems	07-03-2022	25-03-2022	12
2.	Unit –II Arches	26-03-2022	09-04-2022	12
3.	Unit –III Indeterminate Beams	11-04-2022	06-05-2022	12
4.	Unit -IV Analysis of indeterminate structures for beams	7-05-2022	10-06-2022	17
5.	Unit – V Moving loads and Influence diagrams	11-06-2022	27-06-2022	13

Total No. of Instructional periods available for the course: 66 Hours / Periods

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SCHEDULE OF INSTRUCTIONS
COURSE PLAN

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.:____to
1.	1.	07-03-22	1	**Unit – I Energy Theorems** - Introduction about structural analysis	COB 1 & CO 1	L2	Basic Structural analysis I by Janardhana PP 183
	2.	07-03-22	1	Derivation of Strain Energy formula with Axial Load	COB 1 & CO 1	L2	Basic Structural analysis I by Maganti Janardhana PP 184
	3.	11-03-22	1	Derivation of Strain Energy equation with Shear and bending moment	COB 1 & CO 1	L2	Basic Structural analysis I by Maganti Janardhana PP 186
	4.	12-03-22	1	Explain Castiglione 1st theorem – Importance	COB 1 & CO 1	L2	Basic Structural analysis I by Maganti Janardhana PP 198
	5.	12-03-22	1	Calculation of deflection of simply supported beams by Castiglione 1st theorem	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 199
	6.	14-03-22	1	Calculation of deflection of Cantilever beams by Castiglione 1st theorem	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 200
	7.	18-03-22	1	Calculation of deflection of Pin jointed trusses by Castiglione 1st theorem	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 201
	8.	18-03-22	1	Problems on deflection of simple beams	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 211

	9.	19-03-22	1	Problems on deflection of pin jointed trusses.	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 220
	10.	19-03-22	1	Calculation of deflection of Cantilever beams by Castiglione 1st theorem	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 229
	11	21-03-22	1	Calculation of deflection of Pin jointed trusses by Castiglione 1st theorem	COB 1 & CO 1	L3	Basic Structural analysis I by Maganti Janardhana PP 235
	12	25-03-22	1	Calculation of deflection of	COB 1 &	L3	Basic Structural analysis I by Maganti Janardhana PP 240

Unit No.	Lesson No.	Date	No.of Periods	Topics / Sub-Topics	Objectives &Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.:____to
2.	1.	26-03-22	1	**Unit- II** Introduction about **Arches**	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 336
	2.	26-03-22	1	Types of Arches – Three and Two hinged arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 337
	3.	28-03-22	1	Calculation of Horizontal thrust in arches	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 339
	4.	01-04-22	1	Circular and Parabolic arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 342
	5.	02-04-22	1	Yielding of Supports in arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 345
	6.	04-04-22	1	Effect of shortening of rib in arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 358
	7.	08-04-22	1	Effect of temperature changes in arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 389
	8.	08-04-22	1	Tied arch and Linear arch	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 390
	9.	09-04-22	1	Problems on temperature effect	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 391
	10.	09-04-22	1	Problems on three hinged circular arch	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 347
	11	11-04-22	1	Problems on two hinged circular arch	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 339
	12	11-04-22	1	Solving old question papers	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 391

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.: ____to _____
3.	1.	11-04-22	1	Unit-III Indeterminate Beams (Force Method) Introduction about indeterminate beams	COB 3 & CO 3	L2	Basic Structural analysis Iby Maganti Janardhana PP 443
	2.	15-04-22	1	Analyze a Propped cantilever beams with different methods	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 444
	3.	16-04-22	1	Analyze a Propped cantilever beams with different methods carrying with different loads	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 450
	4.	22-04-22	1	Analyze a Propped cantilever beams with different methods carrying with different loads	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 460
	5.	22-04-22	1	Analyze a fixed beams with different methods carrying with different loads	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 481
	6.	23-04-22	1	Analyze a fixed beams with different methods carrying with different loads	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 482
	7.	25-04-22	1	Analyze a fixed beams with different methods carrying with different loads	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 485
	8.	25-04-22	1	Analyze Continuous beam with both ends fixed by Clapeyrone's theorem	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 546
	9.	25-04-22	1	Analyze Continuous beam with one end fixed & other end hinged by Clapeyrone's theorem	COB 3 & CO 4	L4	Basic Structural analysis I by Maganti Janardhana PP 547
	10.	29-04-22	1	Analyze Continuous beam with both ends hinged by Clapeyrone's theorem	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 549
	11.	30-04-22	1	Analyze Continuous beam with one end or both ends overhanging by Clapeyrone's theorem	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 550
	12.	02-05-22	1	Solving old question papers	COB 3 & CO 3	L4	Basic Structural analysis I by Maganti Janardhana PP 555

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives &Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.: ____to ____
4.	1.	06-05-22	1	**Unit - IV Slope – Deflection Equation** – Introduction	COB 4 & CO 4	L2	Basic Structural analysis II by Maganti Janardhana PP 112
	2.	07-05-22	1	Analyze Continuous beam with both ends fixed by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 114
	3.	09-05-22	1	Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 116
	4.	13-05-22	1	Analyze Continuous beam with both ends hinged by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 118
	5.	14-05-22	1	Analyze Continuous beam with one end or both ends overhanging by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 130
	6.	14-05-22	1	Analyze Continuous beam with settlement of supports by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 140
	7.	16-05-22	1	**Moment Distribution Method** Analyze Continuous beam subjected to rotation at any support by Slope Deflection method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 151
	8.	16-05-22	1	Moment Distribution Method Analyze Continuous beam with settlement of supports	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 180
	9.	20-05-22	1	Analyze Continuous beam with both ends fixed by Moment distribution method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 185

	10.	20-05-22	1	Analyze Continuous beam with one end fixed & other end hinged by Moment distribution method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 190
	11.	21-05-22	1	Analyze Continuous beam with both ends hinged by Kani's method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 195
	12.	23-05-22	1	Analyze Continuous beam with one end or both ends by Kani's method	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti Janardhana PP 195

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives &Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.: ____to ____
5.	1.	04-06-22	1	**Unit-V Moving loads and Influence Line diagrams-** Introduction	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 278
	2.	06-06-22	1	Calculate position of load to calculate maximum SF & maximum BM by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 280
	3.	10-06-22	1	Calculate position of specific point load to get maximum SF & maximum BM by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 283
	4.	11-06-22	1	Calculate position of UDL with greater than span and shorter than the span to get Maximum BM & SF by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 286
	5.	13-06-22	1	Calculate position of load to calculate maximum SF & maximum BM by using moving load method under two point loads with fixed distance	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 289
	6.	17-06-22	1	Calculate position of load to calculate maximum SF & maximum BM by using moving load method under several point loads	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 291
	7.	18-06-22	1	Equivalent uniformly distributed load and focal	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 292

				length			
	8.	20-06-22	1	Calculate position of load to calculate maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 293
	9.	20-06-22	1	Calculate position of specific point load to get maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 295
	10.	24-06-22	1	Calculate position of UDL with greater than spa n and shorter than the span to get Maximum BM & SF by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 302
	11.	24-06-22	1	Calculate position of load to calculate maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 308
	12.	25-06-22	1	Solving old question papers	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 316
	13.	27-06-22	1	Solving old question papers	COB 5 & CO 5	L4	Basic Structural analysis Iby Maganti Janardhana PP 320

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SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic **Y**ear	: 2021-22		
Semester	: IIYear II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, Journal…) Page Nos.:
1.	07-03-22	1	**Unit – I Energy Theorems** - Introduction about structural analysis	1 & 1	L2	Basic Structural analysis I by Maganti Janardhana PP 183
2.	07-03-22	1	Derivation of Strain Energy formula with Axial Load	1 & 1	L2	Basic Structural analysis I by Maganti Janardhana PP 184
3.	11-03-22	1	Derivation of Strain Energy equation with Shear andbending moment	1 & 1	L2	Basic Structural analysis I by Maganti Janardhana PP 186
4.	12-03-22	1	Explain Castiglione 1st theorem – Importance	1 & 1	L2	Basic Structural analysis I by Maganti Janardhana PP 198
5.	12-03-22	1	Calculation of deflection ofsimply supported beams by Castiglione 1st theorem	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 199
6.	14-03-22	1	Calculation of deflection of Cantilever beams by Castiglione 1st theorem	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 200
7.	18-03-22	1	Calculation of deflection ofPin jointed trusses by Castiglione 1st theorem	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 201
8.	18-03-22	1	Problems on deflection of simple beams	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 211

9.	19-03-22	1	Problems on deflection of pin jointed trusses.	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 220
10.	19-03-22	1	Calculation of deflection ofCantilever beams by Castiglione 1st theorem	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 229
11.	21-03-22	1	Calculation of deflection of Pin jointed trusses by Castiglione 1st theorem	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 235
12.	25-03-22	1	Calculation of deflection of beams	1 & 1	L3	Basic Structural analysis I by Maganti Janardhana PP 240

Signature of HOD
Date:

Signature of faculty
Date:

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SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic **Y**ear	: 2021-22		
Semester	: IIYear II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, Journal…) Page Nos.:
1.	26-03-22	1	**Unit- II Arches**	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 336
2.	26-03-22	1	Types of Arches – Three andTwo hinged arches	COB 2 & CO 2	L2	Basic Structural analysis I by Maganti Janardhana PP 337
3.	28-03-22	1	Calculation of Horizontal thrust	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 339
4.	01-04-22	1	Circular and Parabolic arches	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 342
5.	02-04-22	1	Yielding of Supports in arches	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 345
6.	04-04-22	1	Effect of shortening of rib in arches	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 358
7.	08-04-22	1	Effect of temperature changes in arches	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 389
8.	08-04-22	1	Tied arch and Linear arch	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana

						PP 390
9.	09-04-22	1	Problems on temperature effect	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 391
10.	09-04-22	1	Problems on three hinged circular arch	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 347
11.	11-04-22	1	Problems on teo hinged circular arch	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 339
12.	11-04-22	1	Solving old question papers	COB 2 & CO 2	L3	Basic Structural analysis I by Maganti Janardhana PP 391

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SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic **Y**ear : 2021-22
Semester : IIYear II Semester
Name of the Program : B.Tech Section : A
Course/Subject : Structural analysis I Course Code : **GR20A2018**
Name of the Faculty : Mrs K Hemalatha Dept. : Civil Engineering
Designation : Asst. Professor

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, Journal)Page Nos.:
1.	11-04-22	1	**Unit- III: propped Cantilever Introduction**	COB 3 & CO 3	L3	Structural analysis II by Maganti Janardhana
2.	11-04-22	1	Analysis of Propped cantilever beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
3.	15-04-22	1	Analysis of Propped cantilever beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
4.	15-04-22	1	Analysis of Propped Cantilever	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
5.	16-04-22	1	Fixed beams Analysis	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
6.	16-04-22	1	Fixed beams Analysis	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
7.	22-04-22	1	Fixed beams Analysis	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
8.	22-04-22	1	Fixed beams Analysis	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
9.	25-04-22	1	Analysis of Continuous beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
10.	29-04-22	1	Analysis of Continuous beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
11.	30-04-22	1	Analysis of Continuous beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana
12.	02-05-22	1	Analysis of Continuous beams	COB 3 & CO 3	L4	Structural analysis II by Maganti Janardhana

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SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic **Y**ear : 2021-22
Semester : II Year II Semester
Name of the Program : B.Tech Section : A
Course/Subject : Structural analysis I Course Code : **GR20A2018**
Name of the Faculty : Mrs K Hemalatha Dept. : Civil Engineering
Designation : Asst. Professor

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, Journal)Page Nos.:
1.	10-05-22	1	**Unit- IV: Slope Deflection method**	COB 4 & CO 4	L3	Basic Structural analysis II by Janardhana PP 112
2.	06-05-22	1	Analysis of beams using SDM	COB 4 & CO 4	L4	Basic Structural analysis II by Maganti PP 113
3.	09-05-22	1	Analysis of beams using SDM	COB 4 & CO 4	L4	Basic Structural analysis II by Janardhana PP 114
4.	09-05-22	1	Analysis of beams using SDM	COB 4 & CO 4	L4	Basic Structural analysis by Maganti Janardhana
5.	13-05-22	1	Moment Distribution method Analysis	COB 4 & CO 4	L4	Basic Structural analysis II by Janardhana PP 116
6.	13-05-22	1	Moment Distribution method Analysis of beams	COB 4 & CO 4	L4	Basic Structural analysis by Janardhana
7.	15-05-22	1	Moment Distribution method Analysis of beams	COB 4 & CO 4	L4	Basic Structural analysis by Maganti Janardhana PP 117
8.	19-05-22	1	Moment Distribution method Analysis of beams	COB 4 & CO 4	L4	Basic Structural analysis II by Janardhana PP 118
9.	21-05-22	1	Kanis method analysis	COB 4 & CO 4	L4	Basic Structural analysis by Maganti Janardhana PP 120
10.	21-05-22	1	Analysis of Continuous beams using Kanis method	COB 4 & CO 4	L4	Basic Structural analysis II by Janardhana PP 130
11.	23-05-22	1	Analysis of Continuous beams using Kanis method	COB 4 & CO 4	L4	Basic Structural analysis by Maganti Janardhana PP 140
12.	23-05-22	1	Kanis method analysis	COB 4 & CO 4	L4	Basic Structural analysis by Maganti Janardhana PP 145

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SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic **Y**ear	: 2021-22		
Semester	: IIYear II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, Journal)Page Nos.:
1.	04-06-22	1	**Unit-V Moving loads andInfluence Line diagrams-** Introduction	COB 5 & CO 5	L3	Basic Structural analysis I byMaganti Janardhana PP 278
2.	06-06-22	1	Calculate position of load tocalculate maximum SF & maximum BM by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 280
3.	10-06-22	1	Calculate position of specificpoint load to get maximum SF & maximum BM by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 283
4.	11-06-22	1	Calculate position of UDL with greater than span andshorter than the span to get Maximum BM & SF by using moving load method	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 286
5.	13-06-22	1	Calculate position of load tocalculate maximum SF & maximum BM by using moving load method under two point loads with fixed distance	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 289
6.	17-06-22	1	Calculate position of load tocalculate maximum SF &	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana

			maximum BM by using moving load method under several point loads			PP 291
7.	18-06-22	1	Equivalent uniformly distributed load and focal	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 292
8.	20-06-22	1	Calculate position of load tocalculate maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 293
9.	20-06-22	1	Calculate position of specificpoint load to get maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 295
10.	24-06-22	1	Calculate position of UDL with greater than spa n andshorter than the span to get Maximum BM & SF byusing ILD's	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 302
11.	25-06-22	1	Calculate position of load tocalculate maximum SF & maximum BM by using ILD's	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 308
12.	25-06-22	1	Solving old question papers	COB 5 & CO 5	L4	Basic Structural analysis I by Maganti Janardhana PP 316

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: GR20A2018
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No:1 Duration of Lesson: 1hr

Lesson Title: Introduction about Structural 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.What is a structure? (COB 1 & CO 1)
2. Explain link and where it use. (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: GR20A2018
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 2 Duration of Lesson: 1hr

Lesson Title: Derivation of strain energy formula with axial load

Instructional/Lesson Objectives:

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

1. Definition of resilience
2. Basic formula for virtual work
3. Formula for strain energy with axial load

Teaching Aids : white board, Different colour markers

Teaching Points :

- Definition of a resilience
- Differentiate between work and virtual work
- Formula for strain energy due to axial load in terms of load and stress

Assignment / Questions:

1.What is a resilience? (COB 1 & CO 1)
2. Explain virtual work with an example. (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 3 Duration of Lesson: 1hr

Lesson Title: Derivation of strain energy formula with shear and bending moment.

Instructional/Lesson Objectives:

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

1. First moment and second moment of areas.
2. Flexural and torsional rigidity.
3. Strain energy due to shear and bending moment.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Definition of a Moment of inertia
- Differentiate between Flexural and torsional rigidity
- Derivation procedure for strain energy due to shear and bending moment

Assignment Questions:

1. Explain the procedure of strain energy due to bending moment? (COB 1& CO 1)
2. Explain the procedure of strain energy due to shear? (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 4 Duration of Lesson: 1hr

Lesson Title: Introduction about Structural 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. What is a structure? (COB 1 & CO 1)
2. Explain link and where it use. (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 5 Duration of Lesson: 1hr

Lesson Title: Castigliano's first theorem

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:
1. Basic formula for castigliano's first theorem
2. Deflection at loading points.
3. Importance of castigliano's theorem.

Teaching Aids : white board, Different colour markers
Teaching Points :

- Definition of a castigliano's first theorem
- How to calculate the deflection using castigliano's first theorem?

Assignment / Questions:

1.What is castigliano's theorem? COB 1 & CO 1
2. Explain procedure to get deflection at any loading point. COB 1 & CO 1

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Calculation of deflection of simply supported and cantilever beams using castigliano's theorem.

Instructional/Lesson Objectives:

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

1. Calculation of strain energy due to axial or bending moment in a whole structure.
2. Derive vertical deflection using castigliano's first theorem.
3. Derive horizontal deflection using castigliano's first theorem as there is no horizontal load.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the procedure to calculate the strain energy stored in the structure.
- Derive the horizontal and vertical deflections using castigliano's first theorem.

Assignment / Questions:

1.Solve the central deflection of a simply supported beam carrying point load at center using castigliano's first theorem? (COB 1 & CO 1)

2. Solve the deflection at free end of a cantilever beam carrying UDL over entire span using castigliano's first theorem? (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 7 Duration of Lesson: 1hr

Lesson Title: Calculation of deflection of pin jointed trusses using castigliano's theorem.

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:
1. Calculation of strain energy due to loading in pin jointed trusses.
2. Derive vertical deflection at loading point
3. Derive horizontal deflection at loading point

Teaching Aids : white board, Different colour markers
Teaching Points :

- Explain the procedure to calculate the forces in the pin jointed truss using method of joints or sections.
- Explain the procedure to calculate the strain energy stored in the structure due to axial loads.
- Derive the horizontal and vertical deflections using castigliano's first theorem.

Assignment / Questions:

1. Solve the vertical deflection of a pin jointed truss for a given loading using castigliano's first theorem? (COB 1 & CO 1)
2. Solve the horizontal deflection of a pin jointed truss for a given loading using castigliano's first theorem? (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 8 Duration of Lesson: 1hr

Lesson Title: Problems on deflection of simple beams and pin jointed trusses

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:
1. Calculation of deflections at desired locations.
2. Calculation of forces in truss members.
3. Calculation of strain energy due to truss members.

Teaching Aids : white board, Different colour markers
Teaching Points :

- Deflection at required locations.
- Evaluate the strain energy due to loading.

Assignment / Questions:

1. What is the deflection of simply supported beam carrying UDL over entire span using energy principles? (COB 1 & CO 1)
2. What is the deflection of cantilever beam carrying UDL over entire span using energy principles? (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester		
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 9,10 Duration of Lesson: 2hr

Lesson Title: Practice work in first unit.

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:
1. Calculation of deflections at desired locations.
2. Calculation of forces in truss members.
3. Calculation of strain energy due to truss members.

Teaching Aids : white board, Different colour markers
Teaching Points :

- Deflection at required locations.
- Evaluate the strain energy due to loading.

Assignment / Questions:

1.What is a strain energy? (COB 1 & CO 1)
2. Explain virtual work with an example and evaluate the deflection of abend using energy principles for given loading. (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit I	:Energy Theorems
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 11, 12 Duration of Lesson: 2hr

Lesson Title: Practice work in first unit.

INSTRUCTIONAL/LESSON OBJECTIVES:

On completion of this lesson the student shall be able to:
1. Calculation of deflections at desired locations.
2. Calculation of forces in truss members.
3. Calculation of strain energy due to truss members.

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

- Deflection at required locations.
- Evaluate the strain energy due to loading.

Assignment / Questions:

1. Solve the vertical deflection of a pin jointed truss under given Loading? (COB 1 & CO 1)
2. Solve the horizontal deflection of a pin jointed truss under given Loading? (COB 1 & CO 1)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 1 Duration of Lesson: 1hr

Lesson Title: Introduction about arches.

Instructional/Lesson Objectives:

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

1. Importance of Arches in constructions
2. Advantage of arch action.
3. Different types of arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Definition of arch action and its advantage
- Differentiate between various arches.
- Explain the importance of arch action.

Assignment / Questions: 1.Explain the types of various arches? (COB 2 & CO 2)
2. Explain the advantages of arch over beams? (COB 2 & CO 2)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 2 Duration of Lesson: 1hr

Lesson Title: Types of arches.

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:
1. Types arches or classification arches.
2. Differentiate between three and two hinged arches.
3. State the importance of three and two hinged arches

Teaching Aids : white board, Different colour markers
Teaching Points :

- Statically in determinacy of three and two hinged arches
- Differentiate between three and two hinged arches

Assignment / Questions:

1. What is three hinged arch? (COB 2 & CO 2)
2. Explain different types of arches with their static in determinacy. (COB 2 & CO 2)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 3 Duration of Lesson: 1hr

Lesson Title: Calculation of horizontal thrust in arches.

Instructional/Lesson Objectives:

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

1. Understand the different parts of a arch.
2. Evaluate the horizontal thrust in three hinged arch.
3. Evaluate the horizontal thrust in two hinged arch.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the horizontal thrust in three hinged arch using equilibrium condition at hinges
- Evaluate the horizontal thrust in two hinged arch using strain energy principle and castigliano's first theorem.

Assignment / Questions:

1. Calculate the horizontal thrust and support reactions of a three hinged arch for given loading?

(COB 2 & CO 2)

2. Calculate the horizontal thrust and support reactions of a two hingedarch for given loading?

(COB 2 & CO 2)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 4 Duration of Lesson: 1hr

Lesson Title: Circular and Parabolic arches.

Instructional/Lesson Objectives:

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

1. Differentiate between circular and Parabolic arches.
2. Evaluate the horizontal thrust in circular arch.
3. Evaluate the horizontal thrust in Parabolic arch.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the horizontal thrust in circular arch using equilibrium condition at hinges for various loadings
- Evaluate the horizontal thrust in parabolic arch under various loadings.

Assignment / Questions:

1. Calculate the horizontal thrust and support reactions of a circular archand draw bending moment diagram for a given loading. (COB 2 & CO 2)
2. Calculate the horizontal thrust and support reactions of a parabolic arch and draw bending moment diagram for given loading? (COB 2 & CO 2)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 5 Duration of Lesson: 1hr

Lesson Title: Yielding of supports in arches.

Instructional/Lesson Objectives:

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

1. Understand the effect of yielding supports in arches.
2. Derive horizontal thrust when supports are yielding.
3. Derive formula for yielding supports in two hinged arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- The effect of horizontal thrust due to yielding of supports in two hinged arches.
- Formula due to yielding supports.

Assignment / Questions:1. Derive the formula for effect of yielding of supports? (COB 2 & CO 2)

2. Find the horizontal thrust for given loading of two hinged arch? (COB 2 & CO 2)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Rib shortening effect in two hinged arches.

Instructional/Lesson Objectives:

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

1. Understand the effect of rib shortening in two hinged arches.
2. Evaluate the formula for rib shortening in two hinged arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- The effect of rib shortening in two hinged arches
- Formula for rib shortening in two hinged arches.

Assignment / Questions:

1.Derive the formula for rib shortening in two hinged arches? COB2&CO 2

2. Find the horizontal thrust when rib shortening is considered in two hinged ach with given loading? COB 2 & CO 2

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 7 Duration of Lesson: 1hr

Lesson Title: Effect of temperature in three and two hinged arches.

Instructional/Lesson Objectives:

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

1. Understand the effect of temperature in three and two hinged arches.
2. The effect of horizontal thrust in three and two hinged arches
3. Write the formulae for effect of temperature effect in three and two hinged arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the effect of temperatures in two and three hinged arches
- Formulae for temperature effect in two and three hinged arches.
- Explanation about the effect of temperature in horizontal thrust

Assignment / Questions:

1. Compute the formulae for three and two hinged arches? COB2&CO2
2. Compute the effect on horizontal thrust due to temperature effect intwo hinged arch under given loading? COB 2 & CO 2

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 8,9 Duration of Lesson: 2hr

Lesson Title: Tied and Fixed arches.

Instructional/Lesson Objectives:

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

1. Understand the tied and fixed arches.
2. Advantages and importance of both tied and fixed arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- The static in determinacy of fixed arch and compatibility equation to solve fixed arch.
- Advantages of tied arch and its importance.

Assignment / Questions:

1. Illustrate the formula for effect of yielding of supports? COB2&CO 2
2. Find the horizontal thrust for given loading of two hinged arch? COB 2 & CO 2

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No:10

Lesson Title: Practice work in arches.

Instructional/Lesson Objectives:

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

1. Evaluation of arch problems.
2. Evaluate the Bending moment, Radial shear, horizontal thrust and support reaction of arches.
3. Evaluate the temperature, rib shortening and yielding of supports effect on arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the procedure to analyze the given arch under given loading conditions.
- Evaluate the effect of horizontal thrust for various effects.

Assignment / Questions: 1. compute the formula for effect of yielding of supports? COB2 &CO2
2. Find the horizontal thrust for given loading of two hinged arch? COB 2 & CO 2

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit II	: Arches
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 12 Duration of Lesson: 1hr

Lesson Title: Practice work in arches.

Instructional/Lesson Objectives:

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

i. Evaluation of arch problems.
ii. Evaluate the Bending moment, Radial shear, horizontal thrust and support reaction ofarches.
iii. Evaluate the temperature, rib shortening and yielding of supports effect on arches.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the procedure to analyze the given arch under given loading conditions.
- Evaluate the effect of horizontal thrust for various effects.

Assignment / Questions:

1.Derive the formula for effect of yielding of supports? COB 2 & CO 2

2. Find the horizontal thrust for given loading of two hinged arch? COB 2 & CO 2

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 1 Duration of Lesson: 1hr

Lesson Title: Introduction about indeterminate beams.

Instructional/Lesson Objectives:

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

1. Understand the static indeterminacy of beams.
2. Evaluate the static in determinacy of various beams.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Definition of static in determinacy of a structures.
- Evaluate the static in determinacy of various beams.
- Differentiate between various beams of their support reactions.

Assignment / Questions:

1. Illustrate various redundant forces at different supports? (COB 3& CO 3)
2. Determine the static in determinacy of given beams? (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 2 Duration of Lesson: 1hr

Lesson Title: Analyze the propped cantilever beams.

Instructional/Lesson Objectives:

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

1. Understand the propped cantilever beams.
2. Evaluate the static in determinacy of propped cantilever beams.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the propped cantilever beam using basic principle.
- Evaluate the prop reaction.

(Upward deflection due prop = Downward deflection due to external load)

Assignment / Questions: 1. Determine the prop support for given loading? (COB 3 & CO 3)
2. Draw BMD and SFD of propped cantilever beam? (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
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Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 3 Duration of Lesson: 1hr

Lesson Title: Analyze the propped cantilever beams.

Instructional/Lesson Objectives:

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

1. Understand the moment area method.
2. Calculate the prop reaction using moment area method for propped cantilever beams.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the propped cantilever beam using moment area method
- Evaluate the prop reaction using moment area method

Assignment / Questions: 1. Determine the prop support for given loading? (COB 3 & CO 3)

2. Draw BMD and SFD of propped cantilever beam? (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 4 Duration of Lesson: 1hr

Lesson Title: Analyze the propped cantilever beams.

Instructional/Lesson Objectives:

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

1. Understand the moment area method under various loading condition.
2. Calculate the prop reaction using moment area method for propped cantilever beam when support is sinking.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the effect of sinking a support.
- Evaluate the prop reaction or support reactions when propped cantilever beam subjected various loading.
- Evaluate the prop reaction or support reactions when support is sinking.

Assignment:

1. Determine the support reaction of a given propped cantilever beam? (COB 3 &CO 3)
2. Determine the support reactions of a propped cantilever beam? (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 5 Duration of Lesson: 1hr

Lesson Title: Analyze the fixed beam using moment area method

Instructional/Lesson Objectives:

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

1. Analyze the fixed beam under different loadings.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the fixed beam using moment area method
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze the fixed beam under different loadings of fixedbeam. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & (SFD) for above fixed beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Analyze the fixed beam using moment area method ad basic methods

Instructional/Lesson Objectives:

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

1. Analyze the fixed beam under different loadings.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers
Teaching Points :

- Analyze the fixed beam using moment area method ad basic methods
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze the fixed beam under different loadings of fixedbeam. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear forcediagram (SFD) for above fixed beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 7 Duration of Lesson: 1hr

Lesson Title: Analyze the fixed beam using moment area method

Instructional/Lesson Objectives:

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

1. Analyze the fixed beam under different loadings with different methods.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the fixed beam using moment area method
- Draw BMD and SFD.
- Differentiate between various beams of their support reactions.

Assignment / Questions:

1. Analyze the fixed beam under different loadings of fixedbeam. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear forcediagram (SFD) for above fixed beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 8 Duration of Lesson: 1hr

Lesson Title: Analyze the fixed beam using clapeyorn's theorem

Instructional/Lesson Objectives:

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

1. Analyze the fixed beam under different loadings using clapeyorn's theorem.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the fixed beam using clapeyorn's theorem
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze the fixed beam under different loadings of fixedbeam. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear forcediagram (SFD) for above fixed beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
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Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 9 Duration of Lesson: 1hr

Lesson Title: Analyze the fixed beam when one end is hinged and other end is fixed.

Instructional/Lesson Objectives:

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

1. Analyze the fixed beam under different loadings when one end is hinged and other end is fixed.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze the fixed beam when one end is hinged and other end is fixed.
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze the fixed beam for different end conditions of afixed beam. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear forcediagram (SFD) for above fixed beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit III	: Indeterminate Structures
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 10 Duration of Lesson: 2hr

Lesson Title: Analyze Continuous beam with both ends hinged by Clapeyorne's theorem.

Instructional/Lesson Objectives:

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

1 Analyze the fixed beam under different loadings when one end is hinged and other end is fixed.
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with both ends hinged by Clapeyrone's theorem. (Three Moment area theorem)
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze Continuous beam with both ends hinged by Clapeyrone'sTheorem of given loading pattern. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
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Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 11 Duration of Lesson: 1 hr

Lesson Title: Analyze Continuous beam with one end or both ends overhanging by Clapeyrone's theorem

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end or both ends overhanging by Clapeyrone's theorem
2. To draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with one end or both ends overhanging by Clapeyrone's theorem.
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze Continuous beam with one end or both ends overhanging by Clapeyrone's theorem of given loading pattern. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam (COB 3 & CO 3)

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LESSON PLAN

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Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 12 Duration of Lesson: 1hr

Lesson Title: Practice the problems in UNIT-3

Instructional/Lesson Objectives:

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

1. Analyze Propped cantilever, Fixed and Continuous beam with different loadings.
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD)

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Propped cantilever, Fixed and Continuous beams.
- Draw BMD and SFD.

Assignment / Questions

1. Analyze Continuous beam with different end conditions by Clapeyorne's theorem of given loading pattern. (COB 3 & CO 3)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam (COB 3 & CO 3)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson Title: – Introduction about Slope-Deflection equation or method.

Instructional/Lesson Objectives:

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

1. Understand the slope-Deflection equation for statically in-determinate structures,
2. Apply slope deflection equations to statically indeterminate structures.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the Slope Deflection equation for statically in-determinate structures.
- Draw BMD and SFD for statically in-determinate structures.

Assignment / Questions:

1. Analyze Fixed beam using slope deflection equation. (COB 4& CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear forcediagram (SFD) for above fixed beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No:2

Lesson Title: – Analyze Continuous beam with both ends fixed by Slope Deflection method

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with both ends fixed by Slope Deflection method
2. Draw SFD and BMD for a continuous beams

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with both ends fixed by Slope Deflection method
- Draw BMD and SFD for a continuous beam.

Assignment / Questions:

1.Analyze continuous beam using slope deflection equation. (COB 4 & CO 4)

2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 3 Duration of Lesson: 1hr

Lesson Title: –Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection Method.

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method
2. Draw SFD and BMD for a continuous beams

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method . (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
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Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 4 Duration of Lesson: 1hr

Lesson Title: –Analyze Continuous beam with both ends hinged by Slope Deflection method

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method

2. Draw SFD and BMD for a continuous beams

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with both ends hinged by Slope Deflection method
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze Continuous beam with both ends hinged by SlopeDeflection method .(COB 4 & CO 5)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 5)

Signature of faculty

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 5 Duration of Lesson: 1hr

Lesson Title: –Analyze Continuous beam with both ends hinged by Slope Deflection method

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method

2. Draw SFD and BMD for a continuous beams.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with one end or both ends overhanging by Slope Deflection method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with one end or both ends overhanging by Slope Deflection method (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: –Analyze Continuous beam with settlement of supports by Slope Deflection method

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end fixed & other end hinged by Slope Deflection method
2. Draw SFD and BMD for a continuous beams

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with settlement of supports by Slope Deflection method
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with one end or both ends overhanging by Slope Deflection method (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Slope Deflection
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 7

Lesson Title: –Analyze Continuous beam subjected to rotation at any support by Slope Deflection method

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam subjected to rotation at any support by Slope Deflection method
2. Draw SFD and BMD for a continuous beams

Teaching Aids : white board, Different colour markers

Teaching Points :

- Study the effect of rotation at any support.
- Analyze Continuous beam subjected to rotation at any support by Slope Deflection method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam subjected to rotation at any support by Slope Deflection method.

   (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam.

   (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Moment Distribution
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 8

Lesson Title: – Introduction about Moment Distribution Method

Instructional/Lesson Objectives:

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

1. Evaluate relative stiffness and Distribution factors at joints.
2. Evaluate the Fixed end moments for various loadings.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Moment Distribution Method
- Evaluate relative stiffness for beam members, Distribution factors etc.,
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam subjected to rotation at any support by Slope Deflection method (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Moment Distribution
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 9		Duration of Lesson: 1hr	

Lesson Title: – Analyze Continuous beam with both ends fixed by Moment distribution method

.

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with both ends fixed by Moment distribution method
2. Check the final moments using equilibrium condition at joints.
3. Draw BMD and SFD.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with both ends fixed by Moment distribution method
- Draw BMD and SFD.

Assignment / Questions:

1. Analyze Continuous beam with both ends fixed by Moment distribution method. (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Moment Distribution
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 10

Lesson Title: – Analyze Continuous beam with both ends fixed by Moment distribution method

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Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end fixed & other end hinged by Moment distribution method
2. Draw BMD and SFD.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with one end fixed & other end hinged by Moment distribution method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with one end fixed & other end hinged by Moment distribution method . (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Kani's Method
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 11 Duration of Lesson: 1hr

Lesson Title: – Analyze Continuous beam with both ends fixed by Kani's method

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Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with both ends hinged by Moment distribution method
2. Draw BMD and SFD.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with both ends hinged by Moment distribution method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with both ends hinged by Moment distribution method. COB 4 & CO 4
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. COB 4 & CO 4

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Kani's Method
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 12

Lesson Title: – Analyze Continuous beam with one end or both ends overhanging by Kani's method.

Instructional/Lesson Objectives:

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

1. Analyze Continuous beam with one end or both ends overhanging by Moment distribution method
2. Draw BMD and SFD.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Analyze Continuous beam with one end or both ends overhanging by Moment distribution method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam with one end or both ends overhangingby Moment distribution method. (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit IV	: Kani's Method
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 13 Duration of Lesson: 1hr

Lesson Title: – Analyze Continuous beam subjected to rotation at any support by Kani's method.

Instructional/Lesson Objectives:

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

1. Know the effect of rotation at supports.
2. Analyze Continuous beam subjected to rotation at any support by Moment distribution method
3. Draw BMD and SFD.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Explain the effect of rotation at supports.
- Analyze Continuous beam subjected to rotation at any support by Moment distribution method.
- Draw SFD and BMD.

Assignment / Questions:

1. Analyze Continuous beam subjected to rotation at any support by Moment distribution method (COB 4 & CO 4)
2. Draw Bending Moment Diagram (BMD) & Shear force diagram (SFD) for above continuous beam. (COB 4 & CO 4)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 1 Duration of Lesson: 1hr

Lesson Title: – Introduction about Moving loads and Influence Line Diagrams.

Instructional/Lesson Objectives:

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

1. Understand the importance Rolling loads and Influence line diagrams (ILD's).
2. Draw ILD's for support reactions.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Understand the importance Rolling loads and Influence line diagrams (ILD's).
- Draw ILD's for support reactions.

Assignment / Questions:

1. Sketch ILD's for support reactions for simply supported girders. (COB 5 & CO 5)
2. Calculate the support reactions using rolling load method. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 2 Duration of Lesson: 1hr

Lesson Title: – Calculate position of load to calculate maximum SF & maximum BM by using moving load method

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using moving load method.
2. Draw ILD's for Maximum and minimum SF and BM's.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the position of loads to get maximum and minimum SF and BM's
- Calculate maximum and minimum SF and BM's.

Assignment / Questions:

1. Calculate the maximum and minimum SF and BM's on simply supported girders. (COB 5 & CO 5)

2. Calculate the maximum and minimum SF and BM's on simply supported girders with over hangings. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 3		Duration of Lesson: 1hr	

Lesson Title: –Calculate position of specific point load to get maximum SF & maximum BM by using moving load method.

Instructional/Lesson Objectives:

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

1. Calculate position of specific point load to get maximum SF & maximum BM by using moving load method
2. Draw ILD's for Maximum and minimum SF and BM's under specific load.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the position of specific load to get maximum and minimum SF and BM's
- Calculate maximum and minimum SF and BM's under specific load.

Assignment / Questions:

1. Calculate the maximum and minimum SF and BM's on simply supported girders under specific load. (COB 5 & CO 5)
2. Calculate the maximum and minimum SF and BM's on simply supported girders with over hangings under specific load. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 4		Duration of Lesson: 1hr	

Lesson Title: – Calculate position of UDL with greater than span and shorter than the span to get Maximum BM & SF by using moving load method

Instructional/Lesson Objectives:

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

1. Calculate position of UDL with greater than span and shorter than the span to get Maximum BM & SF by using moving load method
2. Draw ILD's for Maximum and minimum SF and BM's under Uniformly distributed load.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Evaluate the position of Uniformly Distributed load to get maximum and minimum SF and BM's
- Calculate maximum and minimum SF and BM's under Uniformly distributed load.

Assignment / Questions:

1. Calculate the maximum and minimum SF and BM's on simplysupported girders under uniformly distributed load. (COB 5 & CO 5)

2. Calculate the maximum and minimum SF and BM's on simply supported girders with over hangings under UD load. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 5		Duration of Lesson: 1hr	

Lesson Title: – Calculate position of load to calculate maximum SF & maximum BM by using moving load method under two point loads with fixed distance

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using moving load method under two point loads with fixed distance
2. Draw ILD's for Maximum and minimum SF and BM's under Uniformly distributed load.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate maximum SF & maximum BM by using moving load method under two point loads with fixed distance
- Draw ILD's for above case and evaluate the SF and BM's

Assignment / Questions:

1. Calculate position of load to calculate maximum SF & maximum BM by using moving load method under two point loads with fixed Distance. (COB 5 & CO 5)
2. Calculate the maximum and minimum SF and BM's on simply supported girders with over hangings under UD load. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Moving Loads
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson: 6

Lesson Title: – Calculate position of load to calculate maximum SF & maximum BM by using moving load method under several point loads

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using moving load method under several point loads
2. Draw ILD's for Maximum and minimum SF and BM's under several loads load.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate maximum SF & maximum BM by using moving load method under several point loads.
- Draw ILD's for Maximum and minimum SF and BM's under several loads load.

Assignment / Questions:

1. Sketch ILD's for Maximum and minimum SF and BM'sunder several loads load.

(COB 5 & CO 5)

2. Calculate position of load to calculate maximum SF & maximum BM by using moving load method under several point loads (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagram
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 7		Duration of Lesson: 1hr	

Lesson Title: – Equivalent uniformly distributed load and focal length.

Instructional/Lesson Objectives:
On completion of this lesson the student shall be able to:

1. Evaluate the equivalent uniformly distributed load and focal length

Teaching Aids : white board, Different colour markers
Teaching Points :

- Equivalent uniformly distributed load and
- Focal length

Assignment / Questions:

1. Find the equivalent UDL for several point loads. (COB 5 & CO 5)
2. Calculate the focal length for the given loadings. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagram
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 8 Duration of Lesson: 1hr

Lesson Title: – Calculate position of load to calculate maximum SF & maximum BM by using ILD's

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using ILD's

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate absolute maximum BM by using ILD's

Assignment / Questions:

1. Calculate position of load to calculate maximum SF & maximum BM by using ILD's. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagrams
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 9 Duration of Lesson: 1hr

Lesson Title: – Calculate position of specific point load to get maximum SF & maximum BM by using ILD's.

Instructional/Lesson Objectives:

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

1. Calculate position of specific point load to get maximum SF & maximum BM by using ILD's

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of specific point load to get maximum SF & maximum BM by using ILD's

Assignment / Questions:

1. Calculate position of specific point load to get maximum SF & maximum BM by using ILD's. COB 5 & CO 5

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagrams
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		
Lesson No: 10		Duration of Lesson: 1hr	

Lesson Title: – Calculate position of UDL with greater than spa n and shorter than the span to get Maximum BM & SF by using ILD's

Instructional/Lesson Objectives:

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

1. Calculate position of UDL with greater than spa n and shorter than the span to get Maximum BM & SF by using ILD's

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of UDL with greater than spa n and shorter than the span to get Maximum BM & SF by using ILD's

Assignment / Questions:

1. Calculate position of UDL with greater than span and shorter than the span to get Maximum BM & SF by using ILD's. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagrams
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 11 Duration of Lesson: 1hr

Lesson Title: – Calculate position of load to calculate maximum SF & maximum BM by using ILD's

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using ILD's

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate maximum SF & maximum BM by using ILD's

Assignment / Questions:

1. Calculate position of load to calculate maximum SF & maximum BM by using ILD's. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagrams
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 12 Duration of Lesson: 1hr

Lesson Title: – Practice work in unit-5

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using rolling loads and ILD's.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate maximum SF & maximum BM by using rolling load and ILD methods

Assignment / Questions:

1. Calculate position of load to calculate maximum SF & maximum BM by using rolling loads and ILD's. (COB 5 & CO 5)

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LESSON PLAN

Academic **Y**ear	: 2021-22		
Semester	: II Year II Semester	Unit V	: Influence Line Diagrams
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Lesson No: 13 Duration of Lesson: 1hr

Lesson Title: – Practice work in unit-5

Instructional/Lesson Objectives:

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

1. Calculate position of load to calculate maximum SF & maximum BM by using rolling loads and ILD's.

Teaching Aids : white board, Different colour markers

Teaching Points :

- Calculate position of load to calculate maximum SF & maximum BM by using rolling load and ILD methods

Assignment / Questions:

1. Calculate position of load to calculate maximum SF & maximum BM by using rolling loads and ILD's. (COB 5 & CO 5)

Signature of faculty

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ASSIGNMENT I

1. State Castigliano's First Theorem. CO 1, BL 1
2. Define deflection of Beam. CO 1, BL 1
3. Solve the deflection under the load for a simply supported beam of span L carrying a point load W at a distance 'a' from the left end and 'b' from the right end of the beam. Use Castigliano's First Theorem. CO 1, BL 3
4. Solve the deflection of cantilever beam at free end when the beam is carrying point load Wat free end CO 1, BL 3
5. Solve the deflection of cantilever beam at free end when the beam is carrying uniformly distributed load w per metre run. CO 1, BL 3

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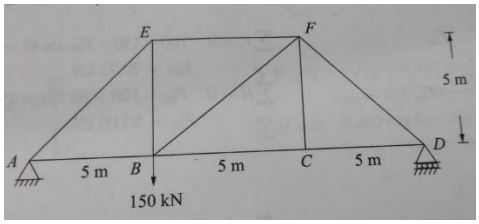
TUTORIAL SHEET I

1. Solve the vertical deflection components of Joint B of the truss loaded as shown in figure by using Strain energy method. A= $500X10^{-6}m^2$ and E= $2X10^5$ N/mm^2



CO 1, BL 3

2. A steel beam of uniform cross section is simply supported on a span of 10m and carries a concentrated load of 50 KN,100KN,150 KN at distance of 1.5m,5.5m and 7m from the left support. Solve the deflection under 150KN load using unit load method CO 1, BL 3

3. Solve the deflection under the load for a simply supported beam of span L carrying a point load W at a distance 'a' from the left end and 'b' from the right end of the beam. Use Castigliano's First Theorem. CO1, BL3

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TUTORIAL SHEET II

1. Classify the arches based on material, shape and structural systems. CO2,BL2
2. Illustrate the differences between arch and beam and explain why bending moments are smaller in arches compared to beam CO 2, BL 2
3. A three hinged parabolic arch of span 15m carrying UDL of 15KN/m over the entire span and point loads 40KN at a distance of 3m from the left support. Solve the Bending moment at 5m from the left support and sketch the bending moment diagram. CO 2, BL3

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ASSIGNMENT II

4. Classify Two Hinged and Three Hinged Arches. CO 2, BL 2
5. Explain the effect of temperature in Two Hinged Arches. CO 2, BL 2
6. A 3-hinged parabolic arch of horizontal span 36 m, central rise 6 m carries a u.d.l. of 30 kN/m on the left half of span starting from the left support hinged and a point load of 60Kn at a distance of 9m from right hinge. Obtain the normal thrust and radial shear at $1/4^{th}$ span from left end. Identify the maximum +ve and –ve B.Ms. Sketch the B.M.D.

   CO 2, BL 3
7. Solve the horizontal thrust of two hinged arch when Subjected to UDL over the entire span. CO 2, BL 3
8. Solve the horizontal thrust of two hinged arch when Carrying point load at the crown

   CO 2, BL 3

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TUTORIAL SHEET III

1. 1. Solve the continuous beam ABC carrying point load 10KN at a distance of 2m from left support on AB span and 10KN at center on BC span using Clapeyron's Three Moment Theorem where A and C are hinged. (AB=BC=6m) CO 3, BL 3
2. Solve the Fixed beam of span 8m carrying UDL 40KN/m over 4m from left support and 80KN at a distance of 2m from right support. Draw the SFD and BMD. CO 3, BL 3
3. A propped cantilever beam of span 3m carrying uniformly distributed load of 10KN/m over the entire span and 5KN point load at centre. Outline the SFD and BMD CO 3, BL 4

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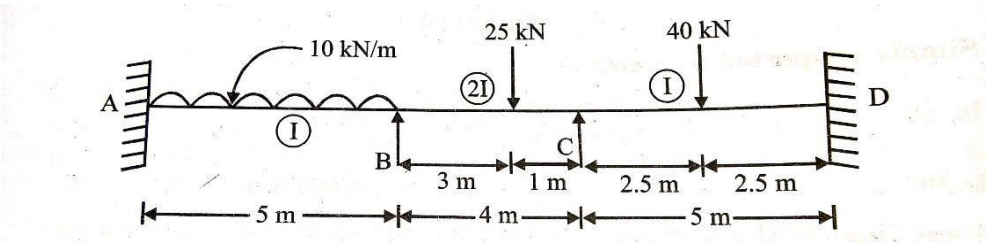
ASSIGNMENT III

1. Summarize the advantages of Continuous Beam over Simply Supported Beam? CO 3, BL 2
2. Define the terms Carry over Moment and Carry over Factor. CO 3, BL 1
3. Analyse the given continuous beam as shown using Clapeyron's Three Moment Theorem



4. Analyse the propped cantilever beam of span 3m carrying uniformly distributed load of 10KN/m over the entire span and 5KN point load at centre. Draw BMD CO 3, BL 4

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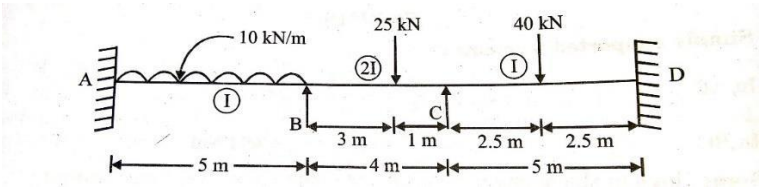
TUTORIAL SHEET IV

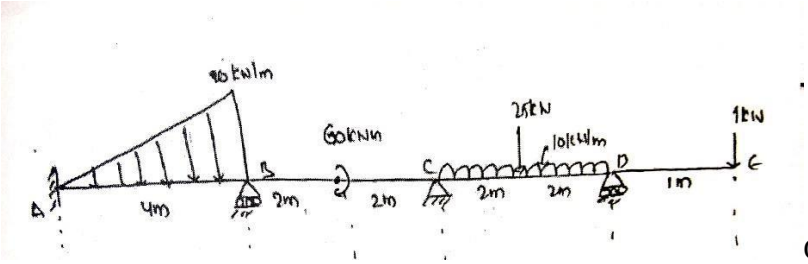
1. Analyze the continuous beam ABC where A and C are fixed carrying point load 60KN at center on AB span and UDL 10KN/m over BC span using slope deflection method (AB=BC=6m) CO 4, BL 1

2. State the assumptions made in Slope deflection method CO 4, BL 1

3. Analyse the given continuous beam as shown using Slope deflection method CO 4, BL 4



4. Analyse the given continuous beam as shown using Moment distribution method



CO 4, BL 4

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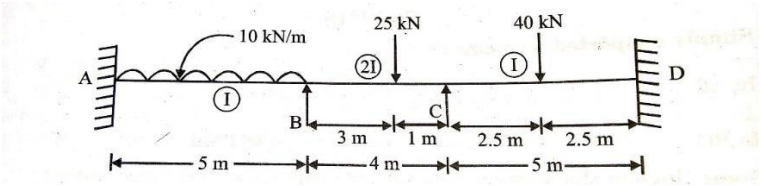
ASSIGNMENT IV

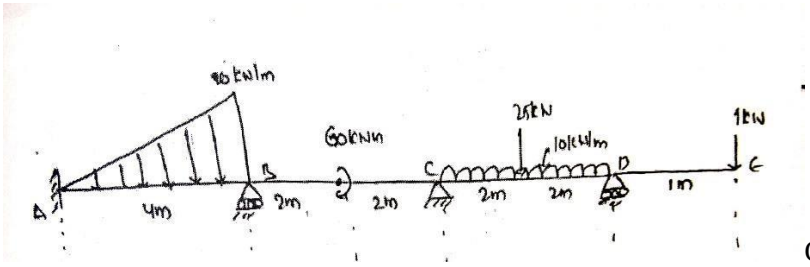
1. Define stiffness of Beam. CO 4, BL 1

2. State the assumptions made in moment distribution method. CO 4, BL 1

3. Analyse the given continuous beam as shown using Moment distribution method CO 4, BL 4



4. Analyse the given continuous beam as shown using slope deflection method



CO 4, BL 4

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TUTORIAL SHEET V

1. Examine the shear force and bending moment for a section at 5m from the left-hand support of a simply supported beam, 20m long. Calculate the maximum bending moment and shear force at the section, due to a uniformly distributed rolling load of length 8m and intensity 10 kN/m run from left to right. CO 5, BL 1
2. Estimate shear force and bending moment for a section at 10m from the left-hand support of a simply supported beam, 30m long. Calculate the maximum bending moment and shear force at the section, due to a uniformly distributed rolling load of length 10m and intensity 30 kN/m run from left to right. CO 5, BL 5
3. Sketch the influence line diagram for S.F. and B. M. at 4 m from the left end of a simply-supported girder of span 10 m. Simplify the maximum S.F. and maximum B.M. at the section if two-wheel loads of 8 kN and 16 kN spaced 2 m apart move from left to right.

   CO 5, BL 4

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ASSIGNMENT V

1. What is meant by Influence Lines? CO 5, BL 1
2. Simplify the ILD for bending moment at any section X of a simply supported beam and mark the ordinates. CO 5, BL 4
3. Estimate shear force and bending moment for a section at 5m from the left-hand support of a simply supported beam, 20m long. Calculate the maximum bending moment and shear force at the section, due to a uniformly distributed rolling load of length 8m and intensity 10 kN/m run from left to right. CO 5, BL 5
4. Sketch the influence line diagram for S.F. and B. M. at 4 m from the left end of a simply-supported girder of span 10 m. Hence simplify the maximum S.F. and maximum B.M. at the section if two-wheel loads of 8 kN and 16 kN spaced 2 m apart move from left to right. CO 5, BL 4

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EVALUATION STRATEGY

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

1. TARGET:

A) Percentage for pass: 80%

b) Percentage of class:

Total Strength: 63

S.No.	Class / Division	No. of Students
1	First Class with distinction	33
2	First Class	15
3	Pass Class	15

2. COURSE PLAN& CONTENT DELIVERY

S.No	Plan	Brief Description
1	Practice classes	60 Theory classes for Section A
3	Assignments	Assignments for solving numerical problems

3. METHOD OF EVALUATION

3.1 Continuous Assessment Examinations

- Assignments: Assignments to assess the knowledge of the student on the basics and concepts in Concrete, Reinforced Concrete, Loads, Stress block parameters, various elements of frame Slabs, Beams, Columns, Footings, Stairs and limit state of serviceability.
- Seminars: To assess the knowledge of the student in DCS-I.
- Quiz: To assess the knowledge of the student in various concepts and basics of DCS-I.
- Internal Examination: Internal Examinations to assess their overall knowledge in DCS-I.

3.2. Semester/End Examination

To test their abilities in the course Design of Reinforced Concrete Structures and to approve their abilities learnt during the same.

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

Introduce drawing of reinforcement details.

Signature of HOD Signature of faculty

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COURSE COMPLETION STATUS

Academic **Y**ear	: 2021-22		
Semester	: IIYear	: II	
Name of the Program	: B.Tech	Section	: A
Course/Subject	: Structural analysis I	Course Code	: **GR20A2018**
Name of the Faculty	: Mrs K Hemalatha	Dept.	: Civil Engineering
Designation	: Asst. Professor		

Units	**Remarks**	**Objectives Achieved**	**Outcomes Achieved**
Unit I	25-03-2022 Unit covered on time	1	1
Unit II	09-04-2022 Unit covered on time	2	2
Unit III	06-05-2022 Unit covered on time	3	3
Unit IV	10-06-2022 Unit covered on time	4	4
Unit V	27-06-2022 Unit covered on time	5	5

Signature of HOD **Signature of faculty**

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

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MAPPINGS

Assessments in Relation to CO's and COB's

Assessments: 1. ASSIGNMENT
2. INTERNAL EXAMINATION
3. EXTERNAL EXAMINATION

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

COB's / Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X

Mappings of COBs, COs vs POs, POBs

Course Objectives – Course Outcomes Relationship Matrix

CO's / COB's	1	2	3	4	5
1	X				
2		X			
3			X		
4				X	
5					X

Course Objectives – Program Outcomes (POs) Relationship Matrix

Program -Outcomes / Course Objectives	a	b	c	d	e	F	g	h	i	j	k	l	Pso 1	Pso2
1	X				X		X		X	X				
2	X	X			X				X	X			X	X
3	X	X			X				X	X				X
4	X	X			X				X	X				X
5	X	X	X		X	X			X	X	X		X	X

Course Outcomes – Program Outcomes (POs) Relationship Matrix

Program -Outcomes / Course-Outcomes	a	b	c	d	e	F	g	h	i	j	k	l	Pso 1	Pso2
1	X				X		X		X	X				
2	X	X			X				X	X			X	X
3	X	X			X				X	X				X
4	X	X			X				X	X				X
5	X	X	X		X	X			X	X	X		X	X

Courses with title & code-Programme Outcomes Relation matrix
Course: Structural analysis I(GR20A2018)

POs / Course	a	b	c	d	e	f	g	h	i	j	k	l	Pso 1	Pso 2
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Program Educational Objectives (PEOs) – Program Outcomes Relationship Matrix

PEOs / Course Objectives	1	2	3
1	X	X	
2	X	X	X
3	X	X	X
4	X	X	X
5	X	X	X

PEOs / Course Outcomes	1	2	3
1	X	X	
2	X	X	X
3	X	X	X
4	X	X	X
5	X	X	X

Course Outcome-Programme Outcomes, Programme Specific Outcomes Mapping

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	Pso 1	Pso2
Determine deflections of beams and trusses using energy methods	M				M		M		M	M				
Analyse three and two hinged of circular and parabolic arches	M	H			M				M	M			M	H
Analyse indeterminate beams using force method for propped cantilever, fixed and Continuous beams (Clapeyorns's three moment theorem)	M	H			M				M	M				M
Apply Slope deflection, Moment distribution and Kani's methods to analysestatically In-determinate structures.	M	H			M				M	M				M
Analyse statically determinate structures using rolling load and influence line methods	M	H	M		M	M			M	M	M		M	M

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RUBRIC TEMPLATE

Course: Structural analysis I — Academic year: 2021-22

Class: II- II — Department: CE

Faculty: K. Hemalatha — Designation: Asst. Professor

Objective: To predict the behaviour of the structure upon loads acting on them.

Student outcomes: The course covers the introduction to the analysis of statically determinate beams, trusses and rigid frames. It covers the construction of influence lines of statically determinate beams, trusses and determining maximum absolute values of shear and moments, determining displacements and rotations by different methods

			Beginning	Developing	Reflecting development	Accomplished	Exemplary	
S No	Name of the student	Performance criteria	1	2	3	4	5	score
1	Mouna (21245 A0105)	Level of knowledge on different types Arches	Low level of knowledge on different types of Arches	Able to understand different types of Arches	Ability to explain the basic different types of Arches	Full knowledge on different types of Arches	Analyzing and application of different types of Arches.	5
		Level of knowledge on Analysis of Indeterminate Structures using Force and displacement methods	Low level of knowledge on Analysis of Indeterminate Structures using Force and displacement methods	Able to calculate Indeterminate Structures using Force and displacement methods	Ability to apply the knowledge on Indeterminate Structures using Force and displacement methods	Full knowledge on Analysis of Indeterminate Structures using Force and displacement methods	Analysis of Indeterminate Structures using Force and displacement methods	5
		Level of knowledge on calculation of slope and deflections of different beams under different loads	Low level of knowledge on calculation of slope and deflection of beams.	Able to calculate slope and deflection of different beams under different loading conditions.	Ability to apply the knowledge of slope and deflection of different beams	Full knowledge on calculation of slope and deflection of different beams under different loading conditions	Analyzing and application of slope and deflection calculations of different beams to design a member.	5

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering (AY:2021-22)
II B.Tech II Semester Objective Question Paper for Mid I
Structural Analysis I (Sub Code:GR20A2018)

Name: _____ **Hall Ticket**

						A			

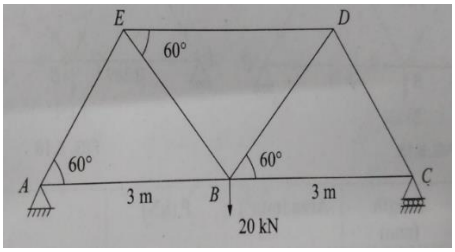
Answer All Questions. **All Questions Carry Equal Marks.**
Time: 10 Min. **Date of Exam: 05/05/2022(AN)** **Marks: (10 X 0.5 = 5)**
Choose the correct alternative:

Q.No.	Questions	Blooms Levels*	Course Outcome
1	What will be the value of U_e if material is linear elastic? Moment is increased from 0 to m gradually. [ ] a. 1⁄4 M θ b. 1⁄3 M θ c. 1⁄2 M θ d. M θ	BL1	CO1
2	What is the shape of load-deformation curve for a linear elastic member? [ ] a. Straight line with constant slope b. Straight line with varying slope c. Curve d. Sine wave	BL1	CO1
3	To apply unit load method and virtual work method it is [ ] Compulsory for external and internal forces to be in equilibrium b. Not compulsory for external and internal forces to be in equilibrium Compulsory for external and internal forces to be in equilibrium in higher loads ompulsory for external and internal forces to be in equilibrium in lesser loads	BL2	CO1
4	Unit load method can be applied when [ ] a. Elastic limit is exceeded b. Elastic limit is not exceeded c. Doesn't depend upon elastic limit d. Can't say	BL2	CO1
5	(I) In two hinged semi-circular arch, the reaction locus is a straight line (II) The distance of reaction locus from abutment is $\frac{\Pi r}{2}$ [ ] a. Both I and II are true b. I is true and II is false c. I is false and II is true d. I and II are false	BL3	CO2
6	A three hinged parabolic arch with hinges at abutments and at crown is under the reaction of uniformly distributed load of intensity "w" per unit length over entire span 'l' through its crown. The bending moment at quarter span is [ ] a. $\frac{w\,l^2}{8}$ b. $\frac{w\,l^2}{12}$ c. Zero d. $\frac{w\,l^2}{24}$	BL3	CO2
7	The main advantage of arch is ---------- [ ] a. decrease the actual beam moment by horizontal thrust momen b. Increase the actual beam moment by horizontal thrust moment c. varies the actual beam moment by horizontal thrust moment d. None of the above	BL2	CO2
8	Which of the following is indeterminate structure? [ ] a. Singly reinforced beam b. Propped cantilever beam c. Over hanging beam d. Simply supported beam	BL1	CO3
9	Prop reduces _____ in the beam. [ ] a. Deflection b. Slope c. Shear d. Moment	BL2	CO3
10	Calculate the reaction at prop of cantilever, if the span of beam is 5m and load is 20 kN at centre. [ ] a. 4.25KN b. 10 KN c. 6.25 KN d. 8 KN	BL3	CO3

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering (AY:2021-22)
II B.Tech II Semester Subjective Question Paper for Mid I
Structural Analysis I (Sub Code:GR20A2018)

Time: 90 Minutes **Date of Exam:05/05/2022(AN)** **Max Marks: (3 X 5 = 15)**

Answer All Questions:

Q. No	Unit	Bloom Levels *	Course Outcome	PI
1	A steel beam of uniform cross section is simply supported on a span of 10m and carries a concentrated load of 50 KN,100KN,150 KN at distance of 1.5m,5.5m and 7m from the left support. Solve the deflection under 150KN load using unit load method	**BL 3**	**CO 1**	**1.4.1**
	OR			
2	Solve the vertical deflection components of Joint B of the truss loaded as shown in figure by using Strain energy method. A= $500X10^{-6}m^2$ and E= $2X10^5$ N/mm^2 	**BL 3**	**CO 1**	**1.3.1**
3	A three hinged parabolic arch of span 20m carrying UDL of 10KN/m over the entire span and point loads 40KN,40KN at a distance of 2m, 3m from the left support. Solve the Bending moment at 4m from the left support and sketch the bending moment diagram.	**BL 3**	**CO 2**	**2.1.2**
	OR			
4	a) Classify the arches based on material, shape and structural systems. b) Illustrate the differences between arch and beam and explain why bending moments are smaller in arches compared to beam	**BL 2**	**CO 2**	**2.2.4**
5	A propped cantilever beam of span 3m carrying uniformly distributed load of 10KN/m over the entire span and 5KN point load at centre. Outline the SFD and BMD	**BL 2**	**CO3**	**4.3.4**
	OR			
6	Summarize the procedure to analyze Propped Cantilever beam and mention the advantages of introducing Prop.	**BL 2**	**CO 3**	**4.1.2**

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering (AY:2021-22)
II B.Tech II Semester Objective Question Paper for Mid II
Structural Analysis I (Sub Code:GR20A2018)

Name: _____ **Hall Ticket**

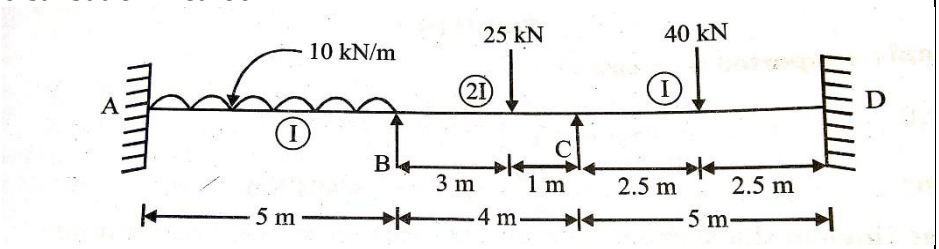
						A			

Answer All Questions. **All Questions Carry Equal Marks.**
Time: 10 Min. **Date of Exam: 01/07/2022(AN)** **Marks: (10 X 0.5 = 5)**
Choose the correct alternative:

Q.No.	Questions	Blooms Levels*	Course Outcome
1	Fixed beam is also known as [ ] a) Encaster beam b) Constressed beam c) In built beam d) Constricted beam	BL1	CO3
2	The Three moment theorem in structural analysis is basically a [ ] a) stiffness method b) displacement method c) energy method d) flexibility method	BL1	CO3
3	Maximum Bending in a fixed beam when subjected to UDL over entire length is[ ] a) Wl2 /12 b) Wl2 /24 c) Wl3 /40 d) Wl3 /48	BL2	CO3
4	In the continuous beam ABC subjected to a udl of w/m length, the value of central support reaction becomes zero if the central support sinks by [ ] a) wL^4 /24EI b) $5wL^4$ /384EI c) $10wL^4$ /384EI d) wL^4 /48EI	BL2	CO3
5	How many sde (slope deflection equations) are possible if 4 supports are there? [ ] a) 0 b) 3 c) 4 d) 6	BL3	CO4
6	How many slope deflection equations are possible if 4 supports are there? [ ] a) 0 b) 3 c) 4 d) 6	BL3	CO4
7	The carry over factor for any member with far end hinged is [ ] a) 0.5 b) 1 c)1.5 d) 0	BL2	CO4
8	In the case of Influence Line diagrams, BMD and SFD [ ] a) Points remain fixed, position of load changes b) Points change, position of loads remains fixed c) Both of them changes d) Neither of them changes	BL1	CO5
9	For drawing ILD, what value of test load is assumed? [ ] a) 1 unit b) Arbitrary c) Depends upon structure d) 0	BL2	CO5
10	The maximum bending moment due to a train of wheel loads on a simply supported girder [ ] a) Always occurs at center of span b) Always occurs under a wheel load c) Never occurs under a wheel load d) None of the above	BL3	CO5

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering (AY:2021-22)
II B.Tech II Semester Subjective Question Paper for Mid II
Structural Analysis I (Sub Code:GR20A2018)

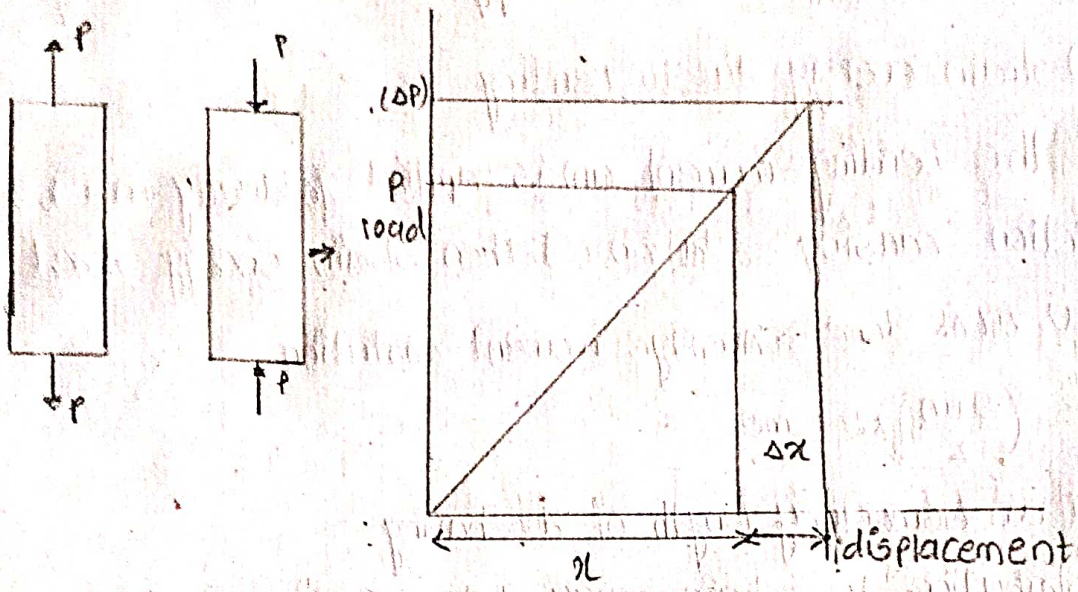
Time: 90 Minutes **Date of Exam:01/07/2022(AN)** **Max Marks: (3 X 5 = 15)**
Answer All Questions:

Q. No	Unit	Bloom Levels *	Course Outcome	PI
1	Solve the continuous beam ABC carrying point load 10KN at a distance of 2m from left support on AB span and 10KN at center on BC span using Clapeyron's Three Moment Theorem where A and C are hinged. (AB=BC=6m)	**BL 3**	**CO 3**	**4.3.1**
	OR			
2	Solve the Fixed beam of span 8m carrying UDL 40KN/m over 4m from left support and 80KN at a distance of 2m from right support. Draw the SFD and BMD.	**BL 3**	**CO 3**	**5.1.2**
3	Analyze the continuous beam ABC where A and C are fixed carrying point load 60KN at center on AB span and UDL 10KN/m over BC span using slope deflection method (AB=BC=6m)	**BL 4**	**CO 4**	**4.3.2**
	OR			
4	Analyze the given continuous beam as shown using Moment distribution method 	**BL 4**	**CO 4**	**4.3.3**
5	Examine the shear force and bending moment for a section at 5m from the left-hand support of a simply supported beam, 20m long. Calculate the maximum bending moment and shear force at the section, due to a uniformly distributed rolling load of length 8m and intensity 10 kN/m run from left to right.	**BL 4**	**CO5**	**10.3.1**
	OR			
6	Sketch the influence line diagram for S.F. and B. M. at 4 m from the left end of a simply-supported girder of span 10 m. Simplify the maximum S.F. and maximum B.M. at the section if two-wheel loads of 8 kN and 16 kN spaced 2 m apart move from left to right.	**BL 4**	**CO 5**	**13.2.1**

Assignment-1

1) Determine an expression for strain energy due to
   a) Axial force b) Bending

a) strain energy due to Axial force



The above figure shows load-displacement diagram subjected to direct applied force. This type of force mainly occur in roof trusses.

when load is P ⟶ Displacement is (x)

when load P+ΔP ⟶ displacement is (x+Δx)

consider a bar of length 'l' under axial force (P) is the extension is "x". if an increment of ΔP causes an extension (Δx). Then the increase in strain energy will be (ΔU) such that

$$\Delta U = (P+\Delta P)(\Delta x)$$

$$\Delta U = (P\Delta x) + (\Delta P \cdot \Delta x)^{0}$$

$$\Delta U = P \times \Delta x$$

$$U = \int_0^P P(\Delta x)$$

$$U = \int_0^P P \times \frac{\Delta P L}{AE} \qquad \because \Delta x = \frac{\Delta P L}{AE}$$

$$\rightarrow \frac{1}{AE}\int_0^P P \cdot \Delta P$$

$\rightarrow \frac{L}{AE} \times \frac{P^2}{2}$

$\rightarrow \frac{P^2 L}{2AE}$

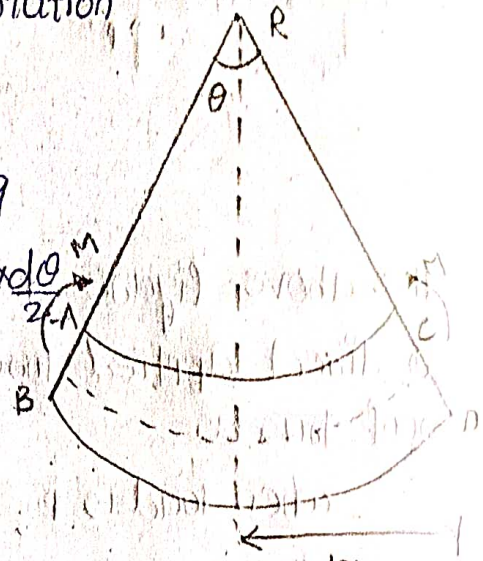
$\therefore U = \frac{P^2 L}{2AE}$ → strain energy due to axial loading

(b) Strain energy due to Bending

If the bending moment (m) is applied gradually on a beam section causing rotation (θ), then strain energy stored is

U = work done → Average moment x rotation

$U = \left(\frac{\theta + m}{2}\right) \times \theta = \frac{m\theta}{2}$



For an elementary length of dx, having distribution 'dθ', strain energy (dU) = $\frac{m \times d\theta}{2}$

From bending eqn → $\frac{m}{I} = \frac{E}{R}$

$\rightarrow \frac{1}{R} = \frac{m}{EI}$

$\rightarrow d\theta = \frac{m \times dx}{EI}$

$dU = \frac{m \times m \times dx}{2EI} \rightarrow \frac{m^2 dx}{2EI}$

∴ For the entire beam

$$U = \int_0^L \frac{m^2 dx}{2EI}$$

2) Find the deflection under the load for a simply supported beam of span L, carrying a point load W at a distance 'a' from left end and 'b' from right end of the beam. use castigliano's first theorem.

$\Sigma V = 0$

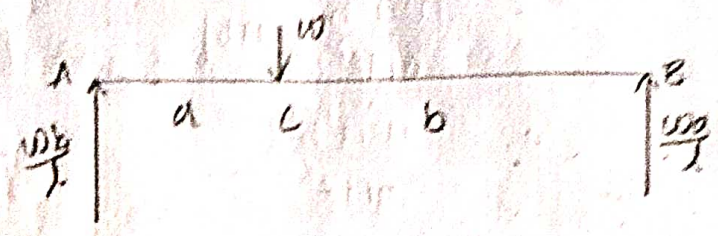
$V_A + V_B = W$

$\Sigma m = 0$

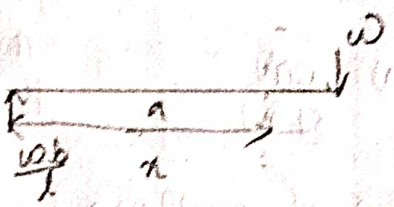
$R_b \times l - Wa = 0$

$R_b = \frac{Wa}{l}$

$R_a = \frac{Wb}{l}$



For span AC



$$U_{AC} = \int_0^a \frac{m_x^2 dx}{2EI}$$

$$= \int_0^a \frac{\left(\frac{Wbx}{l}\right)^2}{2EI} dx$$

$$\frac{1}{2EI} \int_0^a \left(\frac{Wbx}{l}\right)^2 dx$$

$$\rightarrow \frac{W^2b^2}{2EIl^2} \int_0^a x^2 dx \rightarrow \frac{W^2b^2}{2EIl^2}\left[\frac{x^3}{3}\right]_0^a \rightarrow \frac{W^2b^2}{2EIl^2}\left[\frac{a^3}{3}\right]$$

$$U_{AC} = \frac{W^2b^2a^3}{6EIl^2}$$

Similarly for the length BC, with B as the origin strain energy for the portion BC can be obtained as

$$U_{BC} = \frac{1}{2EI} \int_0^b \left(\frac{Wax}{l}\right)^2 dx$$

$$\rightarrow \frac{W^2a^2}{2EIl^2}\left[\int_0^b x^2 dx\right]$$

$$U_{BC} = \frac{W^2a^2b^3}{6EIl^2}$$

Hence the strain energy in two portions

$$U = U_{AB} + U_{BC}$$

$$= \frac{W^2a^3b^2}{6EIl^2} + \frac{W^2a^2b^3}{6EIl^2}$$

$$\frac{w^2a^2b^2}{6EIL^2}[a+b] \qquad (\because a+b=l)$$

$$= \frac{w^2a^2b^2l}{6EIl^2}$$

$$\Delta = \frac{2U}{w}$$

$$\rightarrow \frac{2 \times \frac{w^2a^2b^2}{6EIl}}{w}$$

$$\therefore \text{deflection}(\Delta) = \frac{wa^2b^2}{3EIl}$$

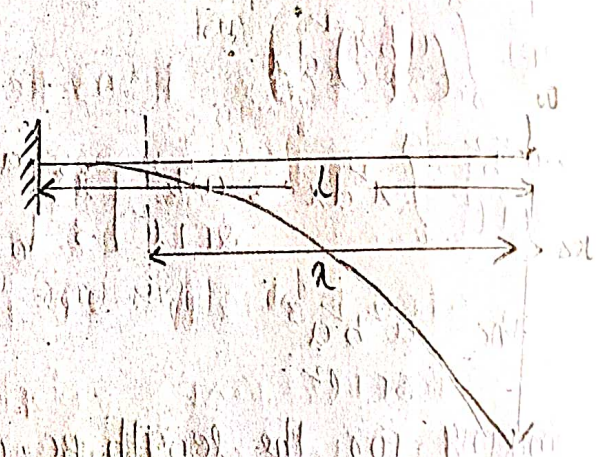
3(a) Find the deflection of cantilever beam at free end when the beam is carrying point load w at free end.

By using castigliano's theorem-1

$$\Delta B = \frac{\partial U}{\partial w}$$

$$U = \int_0^L \frac{mx^2}{2EI}\,dx$$

$$\int_0^L \frac{(-wx)^2}{2EI}\,dx$$



$$\rightarrow \frac{w^2}{2EI}\int_0^L x^2\,dx$$

$$\frac{w^2}{2EI}\left[\frac{x^3}{3}\right]_0^L \rightarrow \frac{w^2L^3}{6EI}$$

$$\Delta B = \frac{\partial U}{\partial w}$$

$$= \frac{\partial}{\partial w}\left[\frac{w^2L^3}{6EI}\right]$$

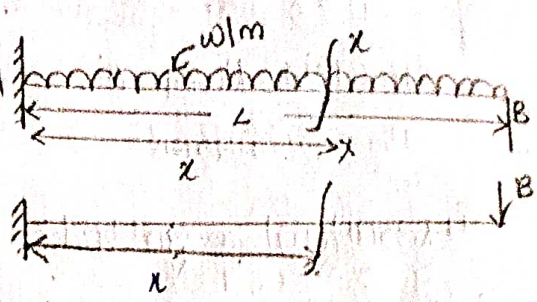
$$\rightarrow \frac{2wL^3}{6EI}$$

$$3$$

$$\Delta B = \frac{wL^3}{3EI}$$

4) Find the deflection of cantilever beam at free end when the beam is carrying uniformly distributed load w per meter run.

Take a unit point load at the section where we are finding the deflection



The rate of change of moment with respect to P is obtained by writing down the expression for bending moment due to unit load as

$$\frac{\partial m}{\partial P} = -1(L-x); \quad m = -\frac{w(L-x)^2}{2}$$

and hence $\Delta_B = \int_0^L \frac{m}{EI} \times \frac{\partial m}{\partial P}\, dx$

$$= w\int_0^L \frac{-w(L-x)^2}{2EI} \times -(L-x)$$

$$= \frac{w}{2EI}\int_0^L (L-x)^3 dx$$

$$\Delta_B = \frac{w}{2EI} \times \left(\frac{(L-x)^4}{4}\right)_0^L$$

$$\rightarrow \frac{w}{2EI}\left[\frac{L^4}{4}\right]$$

$$\rightarrow \frac{wL^4}{8EI}$$

$$\therefore \Delta_B = \frac{wL^4}{8EI}$$

5) A three hinged parabolic arch of span 30m and central rise 4m having UDL of intensity 10KN/m run over a length of 10m from right support find.

a) Resultant magnitude and direction of support reaction.

b) Normal trust, radial shear at 10m from right support

c) Bending moment at left quarter span.

$V_A + V_B = 10 \times 10$

$V_A + R_B = 100KN$

$\Sigma B @ B = 0$

$V_A \times 30 - 10 \times 10 (10/2) = 0$

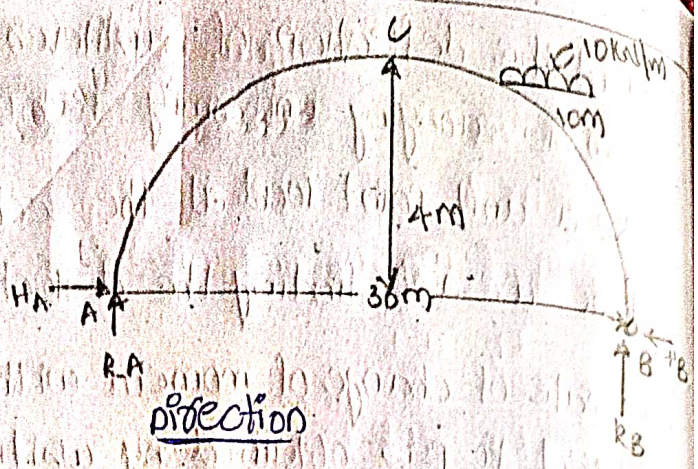
$V_A = 16.67\ KN$

$V_B = 83.33\ KN$

$\Sigma H = 0$

$16.67 \times 15 - H_A \times 4 = 0$

$H_A = 62.5125\ KN$



Resultant magnitude

$R_A = \sqrt{(V_A)^2 + (H_A)^2}$

$= \sqrt{(16.67)^2 + (62.5125)^2}$

$= 64.29\ KN$

$R_B = \sqrt{(V_B)^2 + (H_B)^2}$

$= \sqrt{(83.33)^2 + (62.5125)^2}$

$= 104.17\ KN$

direction

$\theta_A = \tan^{-1}\left(\frac{V_A}{H_A}\right)$

$\tan^{-1}\left(\frac{16.67}{62.5125}\right)$

$\rightarrow 14°55'$

$\theta_B = \tan^{-1}\left(\frac{V_B}{H_B}\right)$

$\tan^{-1}\left(\frac{83.33}{62.5125}\right)$

$53°7'$

Now calculating NT & RS at 10m from Right end

$NT = V\sin\theta + H\cos\theta$

$RS = V\cos\theta - H\sin\theta$

@ 10m $\rightarrow \frac{4hx}{L^2}(L-x)$

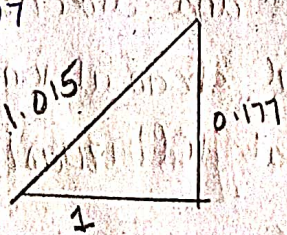
$\rightarrow \frac{4 \times 4 \times 10}{30^2}(30-10) \rightarrow 3.55m$

$\tan\theta = \frac{4h}{L^2}(L-2x) \rightarrow \frac{4 \times 4}{30^2}(30-2(10))$

$\rightarrow 0.177$

$\sin\theta = \frac{0.177}{1.015}$

$\rightarrow 0.174$



$\cos\theta = \frac{1}{1.015}$

$\rightarrow 0.985$

$NT = V\sin\theta + H\cos\theta$

$\rightarrow ((83.33 - (10\times 10))\,0.174 + 62.5125 \times 0.985$

$\rightarrow 58.67\ KN$

$RS = V\cos\theta + H\sin\theta$

$\rightarrow (83.33 - 100)\times 0.985 - 62.5125 \times 0.174$

$\rightarrow -27.3493\ KN$

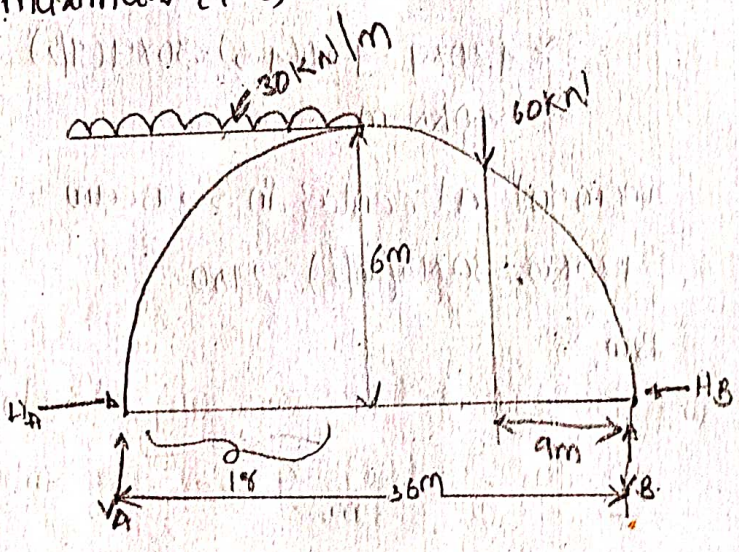
Bm @ left quarter span

$\frac{15}{4} = 3.75m$

$Bm \rightarrow 83.33 \times 3.75 - 62.5125 \times 1.75$

$\rightarrow 203.09\ KN\text{-}m$

6) A 3 Hinged parabolic Arch of horizontal span 36m, central rise 6m carries a U.d.l of 30KN/m on the left hand of span starting from left support hinged and a point load of 60KN at a distance of 9m from right hinge. Obtain the normal thrust and radial shear at 1/4th span from left end. Find the maximum (+ve) and (-ve) sketch the BMD



$VA + VB = 30\times 18 + 60$

$VA + VB = 600$

$m@B = 0$

$VA \times 36 - 30\times 18\left(\frac{18}{2} + 18\right) - 60\times 9 = 0$

$VA = 420KN$

$VB = 180KN$

$\Sigma H = 0$

$m@C = 0$

$420\times 18 - HA \times 16 - 30\times 18\left(\frac{18}{2}\right) = 0$

$HA = HB = 450KN$

$y@9m$

$y = \frac{4hx}{L^2}(L-x)$

$= \frac{4\times 6\times 9}{36^2}(36-9) = 4.5m$

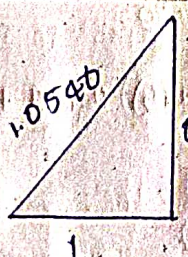
$\tan\theta = \frac{4h}{L^2}(L-2x)$

$= \frac{4\times 6}{36^2}(36 - 2(9))$

$= 0.333$

$\sin\theta = \frac{0.3333}{1.0540}$

$\rightarrow 0.3162$



$\cos\theta = \frac{1}{1.0540}$

$\rightarrow 0.9487$

$NT \rightarrow V\sin\theta + H\cos\theta$

$V \rightarrow 420 - (30 \times 9) = 150$

$NT = (150 \times 0.3162) + (450 \times 0.9487)$

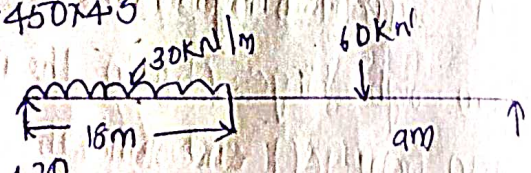
$= 474.345kN$

$RS = V\cos\theta - H\sin\theta$

$= (150 \times 0.9487) - (450 \times 0.3162)$

$= 0.015kN$

moment @ C $\rightarrow$ -405KN-m $\rightarrow 180 \times 9 - 450 \times 4.5$



moment @ 9m from A

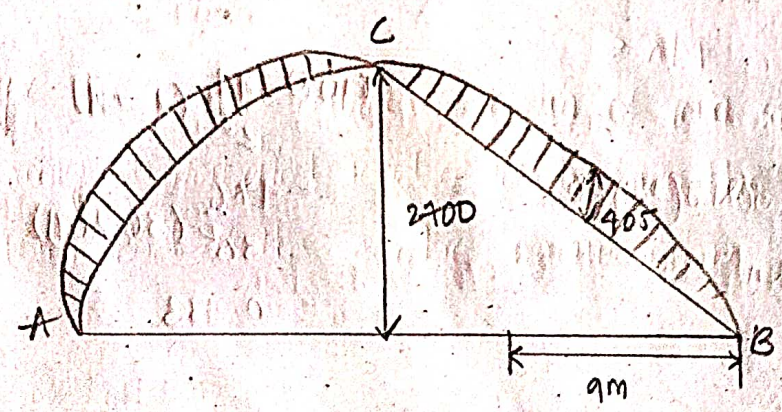
$\rightarrow 420 \times 9 - 450(4.5) - 30 \times 9(9/2)$

$\rightarrow 540KN\text{-}m$

moment at centre in S.S Beam

$420 \times 18 - 30 \times 18(18/2) = 2700$

Bm



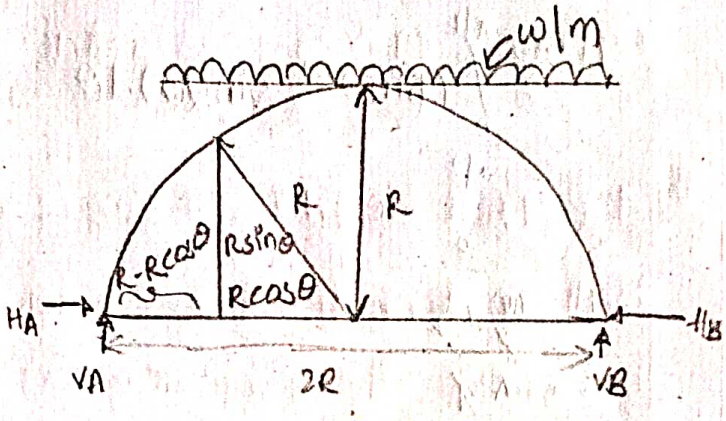
Determine the Horizontal thrust of two hinged arch when

(a) subjected to UDL over the entire span

$R_A + R_B = \omega \times 2R$

$R_A = R_B = \omega R$

Horizontal thrust $(H) = \frac{\int m x y \, dx}{\int y^2 dx}$



$m = \omega R(1-\cos\theta) - \frac{\omega R^2 (1-\cos\theta)^2}{2}$

$H = \frac{\int \omega R^2 (1-\cos\theta)\sin\theta - \frac{\omega R^3}{2}(1-\cos\theta)^2 \sin\theta \, d\theta}{\int R^2 \sin^2\theta \, dx}$

$\therefore y = R\sin\theta$; $dx = R\,d\theta$

limits → 0 to R

In θ → 0 to π/2

$\rightarrow \frac{\int_0^{\pi/2} \omega R^2 (1-\cos\theta)\sin\theta - \frac{\omega R^3}{2}(1-\cos\theta)^2 (\sin\theta)\, d\theta}{\int_0^{\pi/2} R^2 \sin^2\theta \, d\theta}$

$H = \frac{Q}{8} \times \frac{\omega R}{\pi}$

(b) carrying point load at the crown

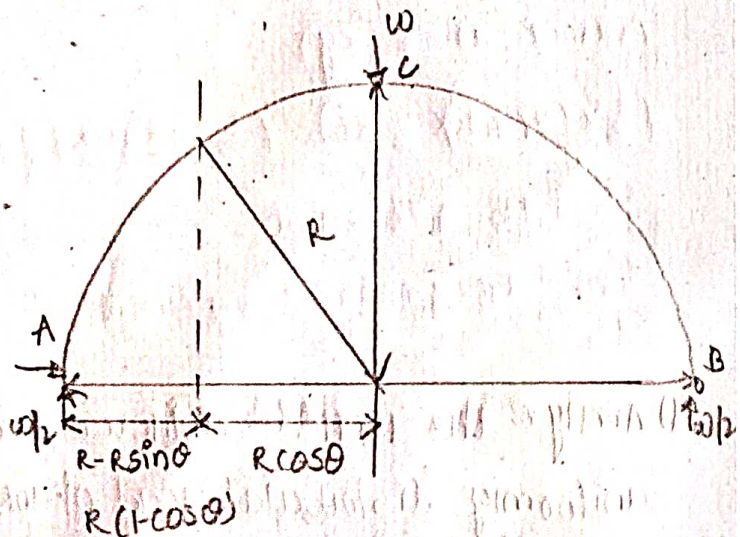
$V_A + V_B = \omega$

$\Sigma m_B = 0$

$V_A \times 2R - \omega \times R = 0$

$V_A = \frac{\omega \times R}{2 \times R}$

$V_A = \omega/2$



$M_x = \frac{\omega}{2} \times R(1-\cos\theta)$

$Y = R\sin\theta$

$H = \frac{\int_0^{\pi/2} \frac{\omega}{2} \times R(1-\cos\theta) \times R\sin\theta \times R\,d\theta}{\int_0^{\pi/2} R^2 \sin^2\theta \, R\,d\theta}$

$$\frac{w/2 \int_0^{\pi/2} (1-\cos\theta)\sin\theta\, d\theta}{\int_0^{\pi/2} \sin^2\theta\, d\theta}$$

$$H = \frac{\frac{w}{2}\int_0^{\pi/2} (\sin\theta - \frac{1}{2}\sin 2\theta)\, d\theta}{\int_0^{\pi/2} \sin^2\theta\, d\theta}$$

$$H = \frac{\frac{w}{2} \times \frac{1}{2}}{\pi/4}$$

$$H = \frac{w}{\pi}$$

Numerator

$$N = \left[1 - \cos\theta - \frac{1}{2}\left(\frac{-\cos 2\theta}{2}\right)\right]_0^{\pi/2}$$

$$\left[-\cos\theta + \frac{\cos 2\theta}{4}\right]_0^{\pi/2}$$

$$[0 - (-1)] + \frac{1}{4}[-1 - 1]$$

$$+1 - \frac{2}{4} = 1/2$$

Denominator

$$\int_0^{\pi/2} \sin^2\theta$$

$$\cos 2\theta = 1 - 2\sin^2\theta$$

$$\sin^2\theta = \frac{1-\cos 2\theta}{2}$$

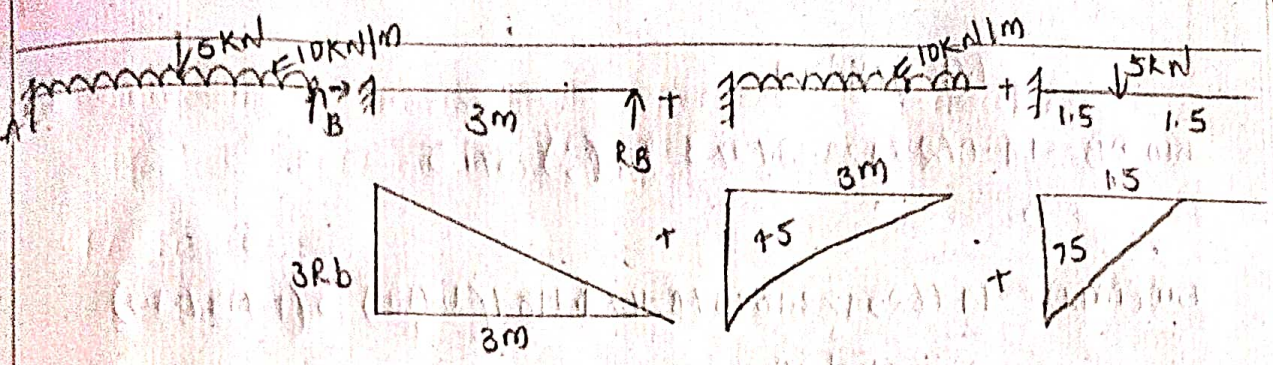
$$\int_0^{\pi/2} \frac{1-\cos 2\theta}{2} \rightarrow \frac{1}{2}\int_0^{\pi/2} 1 - \cos 2\theta\, d\theta$$

$$\rightarrow \frac{1}{2}\left[\theta - \frac{\sin 2\theta}{2}\right]_0^{\pi/2}$$

$$\rightarrow \frac{1}{2}\left[[\pi/2] - \left[\sin\left(\frac{4\pi/2}{2}\right) - \frac{\sin(0)}{2}\right]\right]$$

$$\rightarrow \pi/4$$

9) Analyse the propped cantilever beam of span 3m carrying uniformly distributed load of 10kN/m over the entire span and 5kN point load at the centre draw BMD



$A_1x_1 - A_2x_2 - A_3x_3 = 0$

$(\frac{1}{2}\times3\times3R_B)(\frac{2}{3}\times3) - (\frac{1}{3}\times3\times45)(\frac{3}{4}\times3) - (\frac{1}{2}\times1.5\times7.5)(\frac{2}{3}(1.5)+1.5) = 0$

$R_B(9) - 101.25 - 14.0625 = 0$

$R_B = 12.8125 KN$

$R_A + R_B = 35 - 12.8125$

$= 22.1875 KN$

moment @ A = 0

$-12.8125\times3 + 10\times3(\frac{3}{2}) + 5\times1.5 - M_a = 0$

$M_a = 14.0625$

SF

SF at A = 22.1875

SF at C = (LHS) = 22.1875 − (10 × 1.5)

= 7.1875

SF at C (RHS) = 22.1875 − (10 × 1.5) − 5

= 2.1875

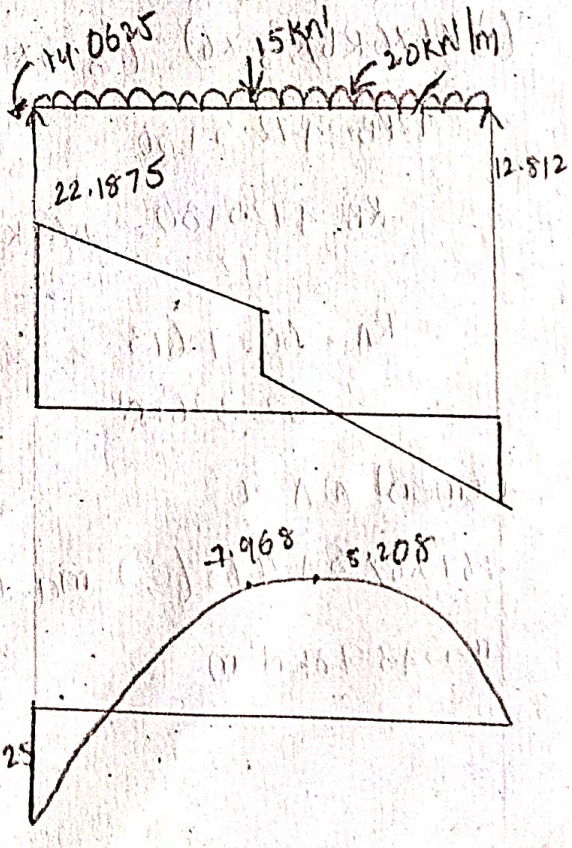
at B = 22.1875 − (10 × 3) − 5

= −12.8125

SF @ x = 0

22.1875 − (10 × x) − 5 = 0

$\frac{22.1875}{10} \Rightarrow x = 1.7187 m$



BM

BM @ A = −14.0625 KN-m

BM @ C = −14.0625 + 22.1875 × 1.5 − 10 × 1.5 $(\frac{1.5}{2})$

$= 7.9687\ KN\text{-}m$

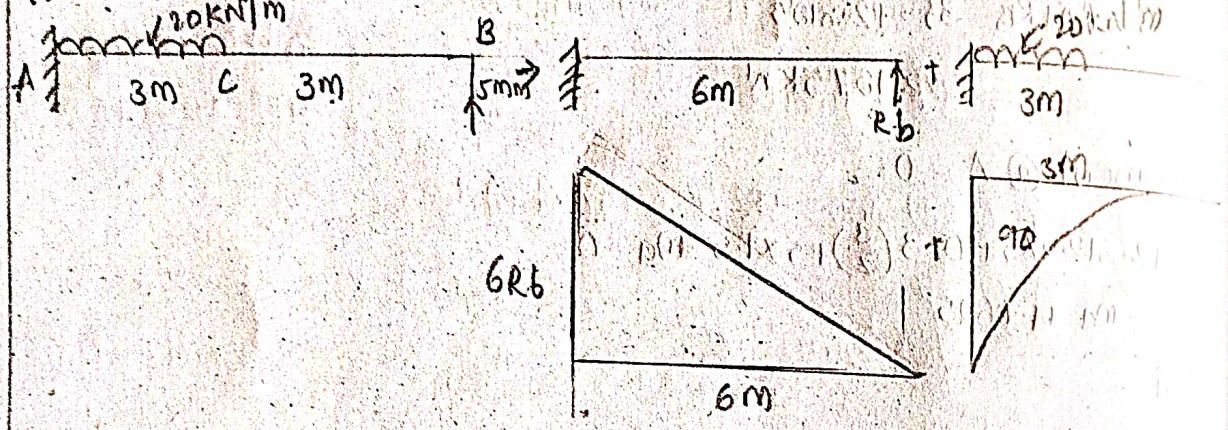
$BM@B = -14.0625 + 22.1875 \times 3 - 10 \times \frac{3}{2}) - 5 \times 1.5$

$= 0$

$BM(max) = -14.0625 + 22.1875 \times 8 - 10 \times 3.7187 \left(\frac{1.7187}{2}\right) - 5(1.7187 - 1.5)$

$= 8.208\ KN\text{-}m$

10) A propped cantilever beam of length 6m carries UDL of 20KN/m over 3m from fixed end during loading the prop sinks by 5mm. determine the prop reaction. draw SFD and BMD. $E = 2 \times 10^5\ N/mm^2$ & $I = 80 \times 10^6\ mm^4$



$A_1x_1 = A_2x_2 = EI(y)$

$\left(\frac{1}{2} \times 6 \times 6R_b \times \frac{2}{3} \times 6\right) - \left(\frac{1}{3} \times 3 \times 90 \times \left(\frac{3}{4}(3) + 3\right)\right) = 2 \times 10^5 \times 80 \times 10^6 \times 5 \times 10^{-12}\ KN\text{-}m^3$

$72R_B = 472.5 + 80$

$R_B = \frac{472.5 + 80}{72} = 7.67\ KN$

$R_A = 60 - 7.673$

$= 52.326\ KN$

moment @A = 0

$-7.67 \times 6 \times 6 + 20 \times 3\left(\frac{3}{2}\right) - M_a = 0$

$M_a = 43.98\ KN\text{-}m$

SE

SF at A = 52.326 KN

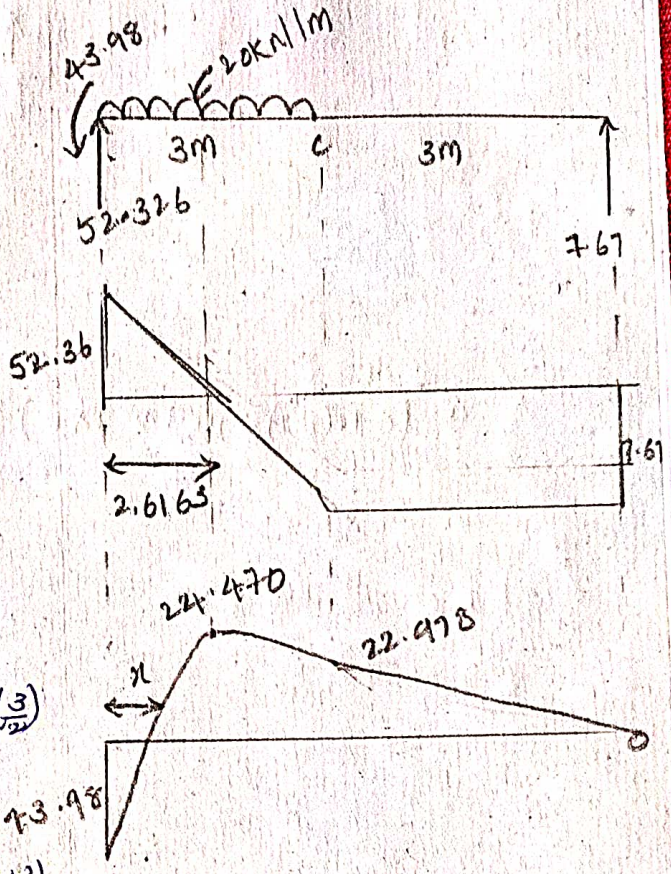
SF at C → 52.326 - (20×3) = -7.674

SF at B → -7.674 kN

SF at x = 0

52.326 - 20x = 0

x = 2.6163 m



BM

BM @ A = -43.98 KN-m

BM @ C = -43.98 + 52.326 × 3 - 20 × 3 (3/2)

= 22.998 KN-m

BM @ B = -43.98 + 52.326 × 6 - 20 × 3 (3/2 + 3)

= 0

BM (max) = -43.98 + 52.326 × 2.6163 - 20 × 2.6163 (2.6163/2) = 24.470 KN-m

BM @ x = 0

-43.98 + 52.326 (x) - 20x (x/2) = 0

x = 1.052 m

Gokaraju Rangaraju Institute of Engineering & Technology

(Autonomous College Affiliated to JNTUH) (12 Pages)

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I	II

MID TERM EXAMINATION

No. 429712

H.T. No.	2	0	2	4	1	A	0	1	0	1

Name of the Examination II-II^ud MID TERM EXAMINATION-I

Course II-B.Tech-2^nd Sem Branch civil. Date 5/5/22

Signature of the Invigilator

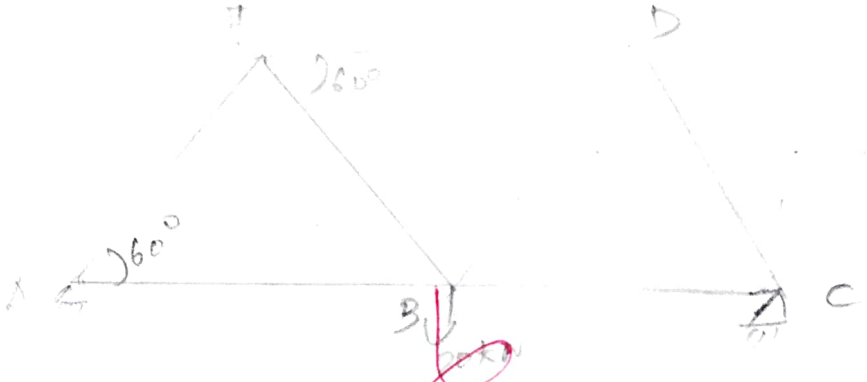
Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS			0						0		0		01

START WRITING FROM HERE

Sol.1 Given loads

a uniform cross-sectional area: 50kN, 100kN, 150kN

250



Given $A = 500 \times 10^{-6} m^2$ $E = 2 \times 10^{-5}$

from Joint 'B'

Strain over $= \frac{\sigma}{E}$

Step 1:

→ Firstly, we should find the Reactions at joints

→ we should draw free body diagram of Reactions, seperately

→

Given

beam of Spam = 3m

force of 5 KN

Bending Moment Diagram:-

Gokaraju Rangaraju Institute of Engineering & Technology

(Autonomous College Affiliated to JNTUH) (12 Pages)

Bachupally, Kukatpally, Hyderabad - 500090

N. Sweetha

I	II	MID TERM EXAMINATION

No. 424742

H.T. No.	2	0	2	4	1	A	0	1	3	2

Name of the Examination II-Semester, I st Midterm Examination.

Course B.Tech II nd Year Branch Civil Engineering Date 05-05-2022.

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	2				2		5		2				9/15

START WRITING FROM HERE

4) **Arches:-** An Arch is a large open space with supports as beams or pillars at both ends. And horizontal reaction is provided for stability.

Arches are classified into 4 types as

Fixed ~~One hinged~~ Arch

Two hinged Arch

Three hinged Arch and

Spandeal Arch.

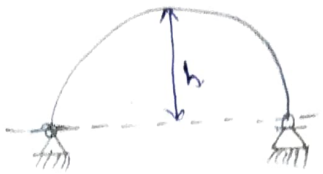
Based on shape as

~~Or~~ Parabolic

Semicircle

Arc. etc.

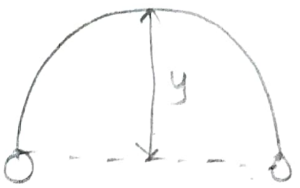
fixed Arch: If the arch is having two fixed ends then it is called as fixed Arch.



Fixed Arch

Two hinged Arch: An Arch with two supports at their two ends is called as two hinged Arch. Two hinged Arch has a Degree of static indeterminancy is '1'.

Two hinged Arch is not flexible as other Arches. In two hinged Arches the temperature effect is more and stresses are more. In two hinged arches deflection will be less.

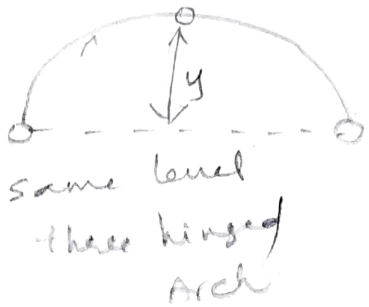


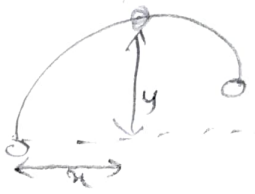
Two hinged Arch

Three hinged Arch: Three Hinged Arch:

The Arch which is having two supports at its ends and having an end at the top most part of the arch. And it is called as crown.

Three hinged Arches are flexible. Deflection is more as crown at centre in this arch. Temperature effect is also less and stresses are less. Three hinged Arches degree of static Indeterminacy is 0.



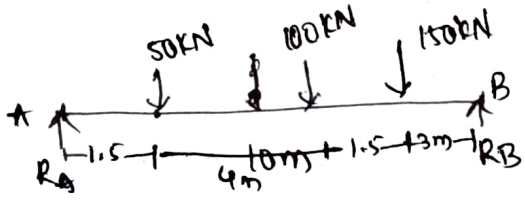


(5b) Difference b/w Arch and Beam.

⇒ Beam is a solid horizontal or vertical member.	⇒ An Arch is a large open space with supports at their ends.
⇒ Beams are classified into different types as	⇒ Arches are classified into 4 different types as
⇒ cantilever beam	⇒ fixed Arch
⇒ fixed beam	⇒ Two hinged Arch

⁘ Continuous beam and ⁘ Over hanging beam. ⁘ Beams are classified only based on their supports present.	⁘ Three hinged Arch and ⁘ spandrel Arch. ⁘ Arches are classified into different types based on their shape structural system, material.

1.



$R_A + R_B = 50 + 100 + 150$

$= 300$ KN.

Consider moments about B.

$= R_A \times 10 - 50 \times 8.5 - 100 \times 6.5 - 150 \times 3$

$= 10 R_A - 1325$

$10 R_A = 1325$

$R_A = 132.5$

$R_A + R_B = 300$

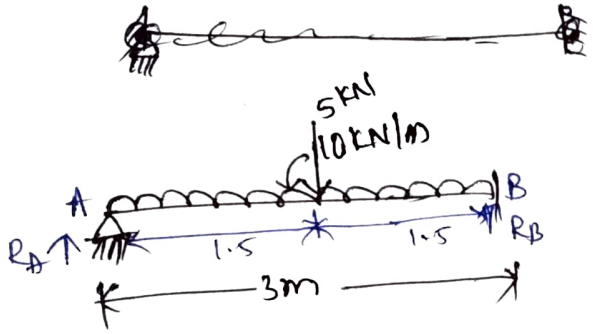
$300 - 132.5 = R_B$

$R_A = 167.5$

Deflection

$$\Delta = \frac{PL}{AE}$$

5)



$R_A + R_B = 5 + 10 \times 3$

$= 5 + 30 = 35$ KN

Consider moment about B.

$= R_A \times 3 - 5 \times 1.5 - 10 \times \left(\frac{10}{2} + 1.5\right)$

$= 3R_A - 7.5 - 10 \times 6.5$

$= 3R_A - 72.5$

$3R_A = 72.5$

$R_A = \frac{72.5}{3}$

$R_A = 24.16$

$R_B = 10.84$

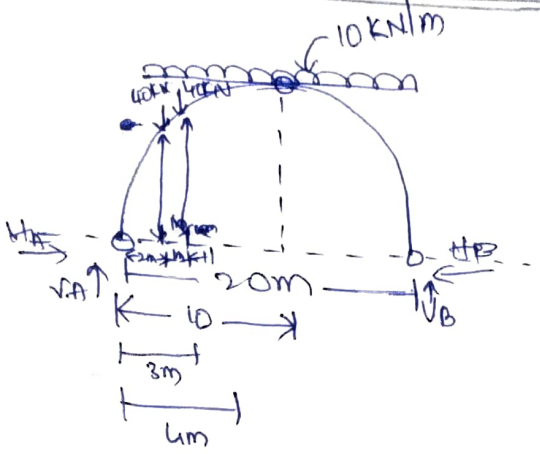
6. Procedure to analyse propped cantilever beam and advantages of introducing prop

Advantages of introducing prop are:

- The shear force and Bending moment at any point can be easily calculated.
- Prop will be helpful in less errors.
- Deflections will be less with prop this.
- Prop is introduced to have the proper strength to beam.

Propped cantilever beam:

3)



$$\Sigma V = V_A + V_B = 40 + 40 + 10 \times 20$$

$$= 80 + 200$$

$$= 280.$$

Consider moments about A or B.

$$H_A = H_B = 0.$$

$$\Sigma M_B = V_A \times 20 - 40 \times 18 - 40 \times 17 - 10 \times \frac{20}{2} \times \frac{20}{3} = 0.$$

$$20 V_A = 3520$$

$$V_A = \frac{3520}{20}$$

$$V_A = 176.$$

$$V_A + V_B = 280$$

$$176 + V_B = 280$$

$$V_B = 280 - 176$$

$$V_B = 104.$$

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P. Mouna

I | II — **MID TERM EXAMINATION**

No. 424642

H.T. No.	2	1	2	4	5	A	0	1	0	5

Name of the Examination CE II YEAR II SEM

Course Structural Analysis-I Branch CE Date 5-5-22

M. Sarada

Signature of the Invigilator

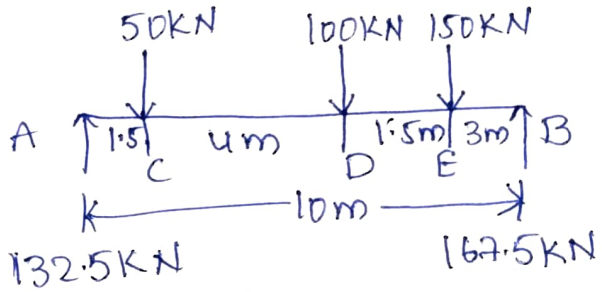
Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	5				5				5				15

START WRITING FROM HERE

1. $\Sigma V = 0$

$R_A + R_B = 50 + 100 + 150$

$= 300\,KN$

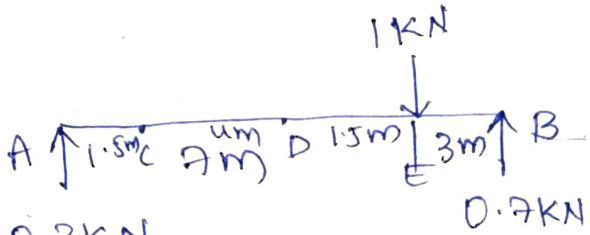


$\Sigma M_B = 0$

$R_A \times 10 - 50 \times 8.5 - 100 \times 4.5 - 150 \times 3 = 0$

$R_A = 132.5\,KN$

$R_B = 167.5\,KN$



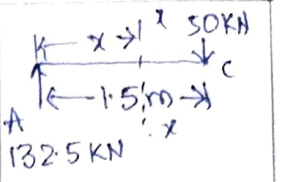
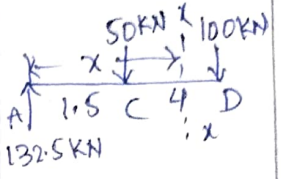
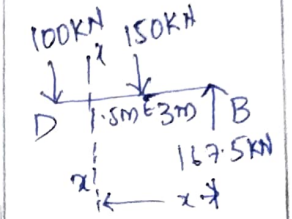
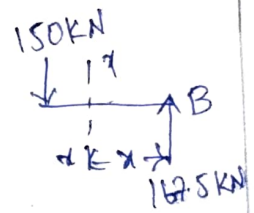
$\Sigma V = 0$

$R_A + R_B = 1\,KN$

$\Sigma M_B = 0$

$R_A \times 10 - 1 \times 3 = 0 \Rightarrow R_A = 0.3\,KN$

$R_B = 0.7\,KN$

Member	origin	limits	M	m	Diagram
AC	A	0-1.5	$+132.5x$	$+0.3x$	
CD	A	1.5-5.5	$132.5x - 50(x-1.5)$	$0.3x$	
DE	B	3-4.5	$167.5x - 150(x-3)$	$0.7x - 1(x-3)$	
EB	B	0-3	$167.5x$	$0.7x$	

$$\Delta = \sum \int \frac{Mm}{EI} \cdot dx$$

$$= \int_0^{1.5} \frac{132.5x \times 0.3x}{EI} dx + \int_{1.5}^{5.5} \frac{(132.5x - 50x + 75)0.3x}{EI} \cdot dx$$

$$+ \int_3^{4.5} \frac{(167.5x - 150x + 450)(0.7x - x + 3)}{EI} \cdot dx + \int_0^3 \frac{16.75x \times 0.7x}{EI} \cdot dx$$

$$= \frac{1}{EI} \int_0^{1.5} 39.75x^2 dx + \frac{1}{EI} \int_{1.5}^{5.5} 39.75x^2 - 15x^2 + 22.5x \cdot dx$$

$$+\frac{1}{EI}\int_{3}^{4.5} -50.25x^2+45x^2-135x+502.5x-450x+1350\cdot dx$$

$$+\frac{1}{EI}\int_{0}^{3}\frac{11.725x^2}{EI}\cdot dx$$

$$=\frac{1}{EI}\left[\int_{0}^{1.5}39.75x^2\cdot dx+\int_{1.5}^{5.5}24.75x^2+22.5x\cdot dx+\int_{3}^{4.5}-5.25x^2\right.$$

$$\left.-82.5x+1350\cdot dx+\int_{0}^{3}11.725x^2\cdot dx\right]$$

$$=\frac{1}{EI}\left[\left(\frac{39.75x^3}{3}\right)_0^{1.5}+\left(\frac{24.75x^3}{3}+\frac{22.5x^2}{2}\right)_{1.5}^{5.5}+\left(\frac{-5.25x^3}{3}-\frac{82.5x^2}{2}\right.\right.$$

$$\left.\left.+1350x\right)_3^{4.5}+\left(\frac{11.725x^3}{3}\right)_0^{3}\right.$$

$$=\frac{1}{EI}\left[\frac{39.75\times1.5^3}{3}+\frac{24.75(5.5^3-1.5^3)}{3}+\frac{22.5(5.5^2-1.5^2)}{2}\right.$$

$$\left.-\frac{5.25(4.5^3-3^3)}{3}-\frac{82.5(4.5^2-3^2)}{2}+1350(4.5-3)+\frac{11.725(3^3)}{3}\right.$$

$$=\frac{1}{EI}\left[44.718+1344.75+315-112.218-464.062+2025\right.$$
$$\left.+105.525\right]$$

$$=\frac{3258.713}{EI}$$

3. $\Sigma V = 0$

$V_A + V_B = 40 + 40 + 10 \times 20$

$= 280\ KN$

$\Sigma M_B = 0$

$V_A \times 20 - 40 \times 18 - 40 \times 17 - \frac{10 \times 20^2}{2} = 0$

$V_A = 170\ KN$

$V_B = 110\ KN$

$\Sigma M_C = 0$

$120 \times 10 - 40 \times 8 - 40 \times 7 - \frac{10 \times 10^2}{2} - H_A \times 5 = 0$

$H_A = 120\ KN = H_B$

$y = \frac{4hx}{L^2}(L - x)$

at $x = 4m$

$y_f = \frac{4 \times 5 \times 4}{20^2}(20 - 4)$

$= 3.2m$

$\frac{dy}{dx} = \frac{4h}{L^2}(L - 2x)$

$\frac{dy}{dx} = \tan\theta = \frac{4 \times 5}{20^2}(20-8)$

$= 0.6$

$\theta = \tan^{-1}(0.6) = 30.96$

$\sin\theta = 0.51, \quad \cos\theta = 0.86$

BM at 4m from left Support

i.e.

$M_f = 170 \times 4 - 40 \times 2 - 40 \times 1 - \frac{10 \times 4^2}{2} - 120 \times 3.2$

$= 96$ KN-m

$M_D = 170 \times 2 - \frac{10 \times 2^2}{2}$

$= 320$ KN-m

$M_E = 170 \times 3 - 40 \times 1 - \frac{10 \times 3^2}{2}$

$= 425$ KN-m

BM at 4m from Right Support

i.e. M_G

$y_G = 3.2$m

$M_G = 110 \times 4 - 120 \times 3.2 - \frac{10 \times 4^2}{2} = 0$ KN-m

$$\sum \frac{A_i x_i}{EI} = 0$$

$$\sum A_i x_i = 0$$

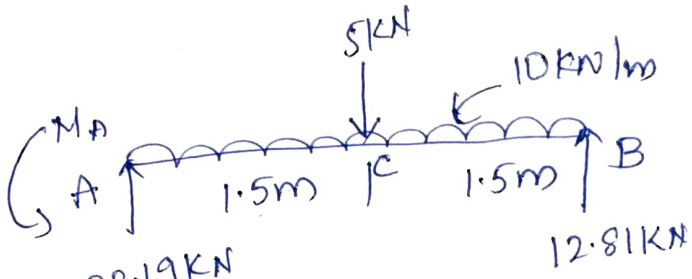
$$A_1 x_1 - A_2 x_2 - A_3 x_3 = 0$$

$$4.5 R_B \times 2 - 5.625 \times 2.5 - 45 \times 2.25 = 0$$

$$R_B = 12.81\ KN$$

$$R_A = 22.19\ KN$$

Free Body Diagram



$\Sigma M_B = 0$

$$22.19 \times 3 - \frac{10 \times 3^2}{2} - 5 \times 1.5 - M_A = 0$$

$$M_A = 14.07\ KN\text{-}m \text{ (Anti-clockwise)}$$

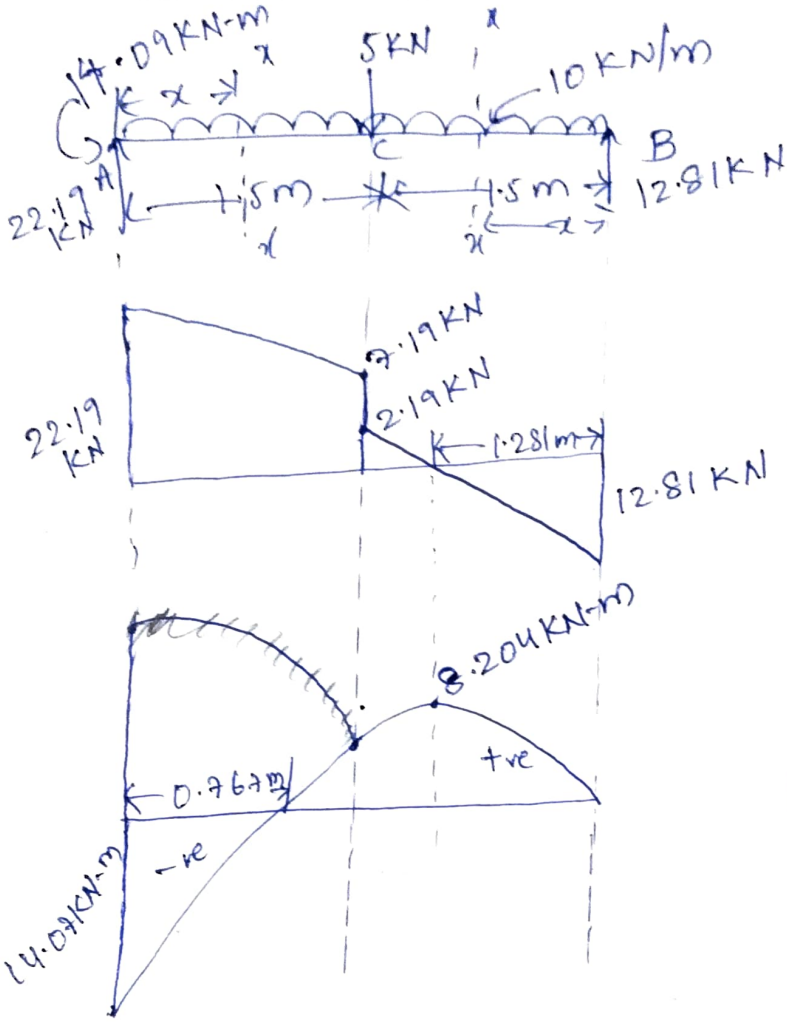
$$M_C = 12.81 \times 1.5 - \frac{10 \times 1.5^2}{2} = 7.965\ KN\text{-}m$$

Consider Section at 'x' distance from B

$$\Sigma F_y \Rightarrow 12.81x - \frac{10x^2}{2} = 0$$

$$x = \frac{12.81}{10} = 1.281\ m \text{ from B}$$

$$M_{@1.281m} = 12.81(1.281) - \frac{10(1.281)^2}{2} = 8.204\ KN\text{-}m$$



Consider a section 'x' m from A

$$M_x \Rightarrow -14.09 + 22.19x - \frac{10x^2}{2} = 0$$

$$-5x^2 + 22.19x - 14.09 = 0$$

$$x = 0.767\text{m} \text{ from A}$$

GR20 2021-22 B.Tech CE 220 GR20A2018 Structural Analysis - I Sessional Marks

S.No	Roll No	MID-I Marks	MID-II Marks	Tutorial Marks	Assessment Marks	Sessional Marks
1	20241A0101	4	8	4	4	14
2	20241A0102	5	8	4	4	15
3	20241A0103	4	4	4	4	12
4	20241A0104	15	16	5	5	26
5	20241A0105	4	4	4	4	12
6	20241A0106	6	5	4	4	14
7	20241A0107	5	4	4	4	13
8	20241A0108	AB	8	4	4	12
9	20241A0109	5	2	4	4	12
10	20241A0110	3	7	4	4	13
11	20241A0111	3	7	4	4	13
12	20241A0112	11	15	5	5	23
13	20241A0113	4	5	4	4	13
14	20241A0114	5	2	4	4	12
15	20241A0115	9	7	4	4	16
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48	20241A0150	16	18	5	5	27
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50	20241A0152	6	10	4	4	16
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54	20241A0156	4	7	4	4	14
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56	20241A0158	14	13	5	5	24
57	20241A0159	7	9	4	4	16

58	20241A0160	9	11	5	5	20
59	21245A0101	17	19	5	5	28
60	21245A0102	18	16	5	5	27
61	21245A0103	19	15	5	5	27
62	21245A0104	20	20	5	5	30
63	21245A0105	20	20	5	5	30

Sections: A

Signatures:

CODE: GR20A2018 | GR 20 | SET- 3

II B.Tech II Semester Regular Examinations, July/August 2022

STRUCTURAL ANALYSIS – I
(Civil Engineering)

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

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)

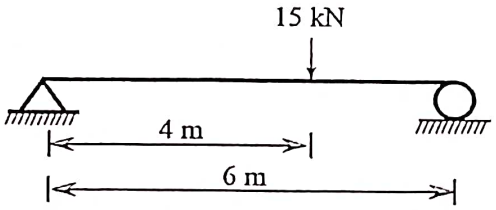
10 * 2 = 20 Marks

1. a.	Infer the complementary strain energy theorem. BL2, CO1	[2]	
b.	Define bending moment of a simply-supported planar beam carrying UDL. CO1, BL1	[2]	
c.	Sketch any two types of arches. CO2, BL1	[2]	
d.	Infer the advantages of arches over other structural systems. CO2, BL2	[2]	
e.	Enumerate any two applications of a propped cantilever beam. CO3, BL3	[2]	
f.	Define Clapeyron's theorem of three moments. CO3, BL1	[2]	
g.	Interpret the significance of fixed-end moments in the slope-deflection method. CO4,	[2]	BL2
h.	Perceive the significance of distribution factor in the moment distribution method. CO4,	[2]	BL3
i.	Define inflection point in a beam. CO5, BL1	[2]	
j.	What is absolute maximum bending moment due to point load? CO5, BL1	[2]	

PART – B
(Answer ALL questions. All questions carry equal marks)

5 * 10 = 50 Marks

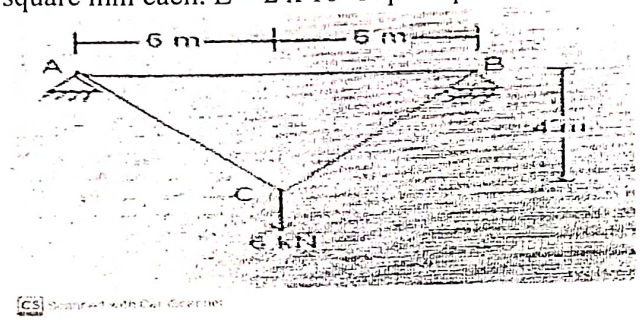
2. Analyse the following beam using strain energy method. Take, EI = Constant. [10] CO1, BL4



OR

3. Determine the vertical and horizontal displacements of the point C of the pin jointed frame shown in figure. The cross sectional area of AB is 125 square mm and of AC and BC are 175 square mm each. E = 2 x 10^5 N per square mm. [10]

CO1, BL5



4. A parabolic arch has a span of 40 m and a rise of 8 m, a concentrated load of 5 kN acts from 10 m from the left hinge. The second moment of area varies as the secant of the inclination of the arch axis. Calculate the horizontal thrust and the reactions at the hinge. Also determine the bending moment at the section 10m from left support. [10]

CO2, BL5

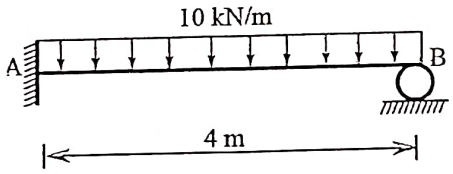
OR

5. A three-hinged semi-circular arch of uniform cross section of span 30 m, and central rise 15 m carrying an udl of 10 kN/m throughout the arch. Calculate the location and magnitude of maximum bending moment in the arch. Draw bending moment diagram. [10]

CO2, BL4

6. Analyse the following propped-cantilever beam using force method. Take, EI = Constant. [10]

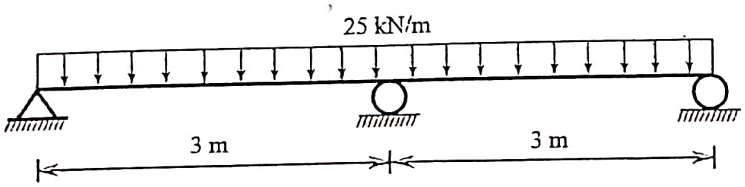
CO3, BL4



OR

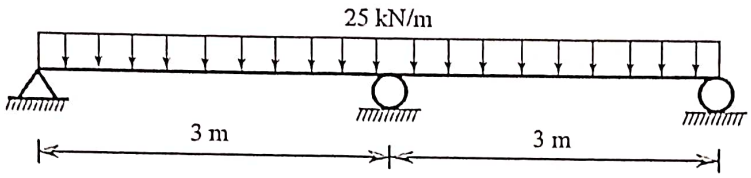
7. Analyse the following two-span continuous beam using Clapeyron's theorem of three moments. Take, EI = Constant. [10]

CO3, BL4



8. Analyse the following two-span continuous beam using slope-deflection method. Take, EI = Constant. [10]

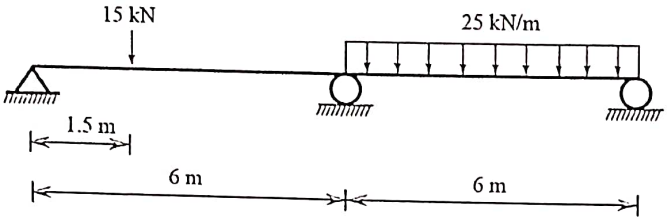
CO4, BL4



OR

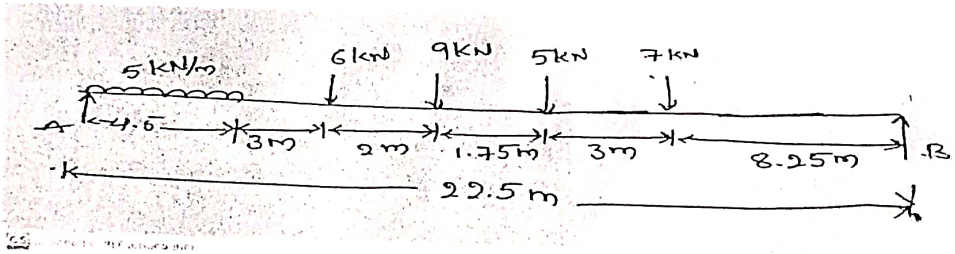
9. Determine the end moments for the following beam using moment distribution method. Take, EI = Constant. [10]

CO4, BL5



10. Four wheel load of 7,5,9 & 6 kN cross a girder of span 22.5m from the left to right followed by an UDL of 5kN/m of 4m length. The 7kN load is leading. The spacing between the loads are shown in fig 2. The head of UDL is 3m from the last load of 6kN. Using influence lines calculate the shear force and bending moment at a section 8m form the left support when the 5kN load is at the center of span. [10]

CO5, BL5



OR

11. Sketch the influence line diagram for S.F. and B. M. at 4 m from the left end of a simply-supported girder of span 10 m. Hence find the maximum S.F. and maximum B.M. at the section if two wheel loads of 8 kN and 16 kN spaced 2 m apart move from left to right. [10]

CO5, BL5

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