Kandula Srinivasa Reddy Memorial College of Engineering (Autonomous)

Kadapa-516003. AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

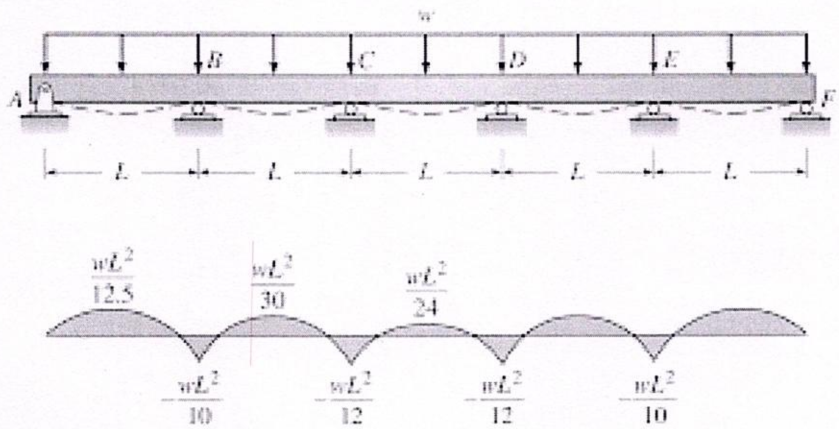
(An ISO 9001-2008 Certified Institution)

Department of Civil Engineering

Certification Course

on

Design of continuous beams using Microsoft Excel spread sheets



Course Instructor:

Prof. G. Sreenivasa Reddy, Professor, Civil Engg. Dept., KSRMCE

Course Coordinators:

U. Arun Kumar and C. Neelima, Assistant Professor, Civil Engg. Dept., KSRMCE

Lr./KSRMCE/CE/2020-21/ Date: 01-09-2020

From
U. Arun Kumar and C. Neelima,
Asst. Professor,
Dept. of Civil Engineering,
KSRMCE (A),
Kadapa.

To
The Principal,
KSRMCE (A),
Kadapa.

Sub: Permission to Conduct Certificate Course – Reg.

Respected Sir,

The Department of Civil Engineering is planning to offer a certification course on Design of continuous beams using Microsoft Excel spread sheets for B. Tech. students of Civil Engineering. The course will start on 07th - 09 - 2020 and the course will run for a total number of 30 hours. In this regard, I am requesting you to accept the proposal to conduct certification course.

Thanking you

Yours faithfully

C. Neel

(U. Arun Kumar & C. Neelima)

Permitted
V. S. S. Murthy

K.S.R.M. COLLEGE OF ENGINEERING
(UGC-AUTONOMOUS)
Kadapa, Andhra Pradesh, India– 516 003
Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.
An ISO 14001:2004 & 9001: 2015 Certified Institution

Cr./KSRMCE/CE/2020-21/

Date: 02/09/2020

Circular

The Department of Civil Engineering is offering a certification course on Design of continuous beams using Microsoft Excel spread sheets. The course will start from 07-09-2020 to 21-09-20 and the course will run for a total number of 30 hours. In this regard, interested students of Civil Engineering are required to register for the Certification Course. The registration link is given below.

https://docs.google.com/forms/f/g/lsQkfofgvUfjef5I22w8kcLIQEdky61sop7Mhdc97n6GsR34skdmfi10w/viewform

The Course Coordinator
U Arun Kumar & C Neelima,
Assistant Professor,
Department of Civil Engg.- KSRMCE.

V.S.S. Murthy

Principal

PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

Cc to:

The Director, KSRMCE

The HoD-Civil, KSRMCE

IQAC-KSRMCE

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Department of Civil Engineering

Registration list of Certification course on
Design of continuous beams using Microsoft Excel spread sheets

Sl. No.	Student Roll No.	Student Name	Mail ID
1	189Y1A0126	Venkata Jithendhar Reddy Duddekunta	189Y1A0126@ksrmce.ac.in
2	189Y1A0132	Lakshmi Prasad Reddy Guddila	189Y1A0132@ksrmce.ac.in
3	189Y1A0134	Nitheesh Gunigari	189Y1A0134@ksrmce.ac.in
4	189Y1A0135	Sreeveni Hasti	189Y1A0135@ksrmce.ac.in
5	189Y1A0144	Bhanumanikanta Reddy Kannapu	189Y1A0144@ksrmce.ac.in
6	189Y1A0146	Govardhan Kaveti	189Y1A0146@ksrmce.ac.in
7	189Y1A0156	Sudheer Kumar Maadam	189Y1A0156@ksrmce.ac.in
8	189Y1A0158	Lokeshwar Reddy Mallireddy	189Y1A0158@ksrmce.ac.in
9	189Y1A0159	Ganesh Mandla	189Y1A0159@ksrmce.ac.in
10	189Y1A0163	Sampath Kumar Meka	189Y1A0163@ksrmce.ac.in
11	189Y1A0166	Siva Prasad Reddy Mitta	189Y1A0166@ksrmce.ac.in
12	189Y1A0171	Venkata Sai Poojith Nagalla Pati	189Y1A0171@ksrmce.ac.in
13	189Y1A0172	Venkatesh Nagirikanti	189Y1A0172@ksrmce.ac.in
14	189Y1A0175	Abhish Nanubala	189Y1A0175@ksrmce.ac.in
15	189Y1A0179	Jayachandra Sai Pandugolu	189Y1A0179@ksrmce.ac.in
16	189Y1A0187	Rakesh Prasanna Penubala	189Y1A0187@ksrmce.ac.in
17	189Y1A0193	Bindhu Rachamallu	189Y1A0193@ksrmce.ac.in
18	189Y1A0195	Swarna Latha Seelam	189Y1A0195@ksrmce.ac.in
19	189Y1A0198	Afroz Shaik	189Y1A0198@ksrmce.ac.in
20	189Y1A01B0	Sateesh Kumar Reddy Thallapalle	189Y1A01B0@ksrmce.ac.in
21	189Y1A01B4	Gayathri Thopudurthy	189Y1A01B4@ksrmce.ac.in

22	189Y1A01B8	Venkata Hemanth Usugari	189Y1A01B8@ksrmce.ac.in
23	189Y1A01C3	Ganga Swetha Vennapusa	189Y1A01C3@ksrmce.ac.in
24	189Y1A01C6	Naga Hema Pranitha Sree Yelikanti	189Y1A01C6@ksrmce.ac.in
25	189Y1A01C8	Sivanatha Reddy Yeturu	189Y1A01C8@ksrmce.ac.in
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43	199Y5A0150	Sambasivareddy Sanikommu	199Y5A0150@ksrmce.ac.in
44	199Y5A0152	Mohammad Arief Shaik	199Y5A0152@ksrmce.ac.in
45	199Y5A0155	Sravani Sirigiri	199Y5A0155@ksrmce.ac.in

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

Syllabus of Certification Course

Course Name: Design of continuous beams using Microsoft Excel spread sheets

Duration: 30 Hours

MODULE I:

Flexibility Method of Analysis- Continuous beams with both ends fixed, one end fixed, both ends hinged, one side over hanging, both ends over hanging and with settlements at supports.

MODULE II:

Stiffness of Analysis- Continuous beams with both ends fixed, one end fixed, both ends hinged, one side over hanging, both ends over hanging and with settlements at supports.

MODULE III:

Introduction of MS Office Excel, creating spreadsheets for various continuous beam problems using flexibility method and stiffness method.

Textbooks:

1. D. Menon , Advanced Structural Analysis, Narosa Publication, 2020.
2. Das, Structural Analysis, Prentice Hall India Learning Private Limited; 1St Edition, 2011.

Reference Books:

1. Bittu Kumar, Mastering MS Office, V&S Publishers, 2017.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
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V. S. S. Murty

PRINCIPAL
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Department of Civil Engineering

Certification course on "Design of continuous beams using Microsoft Excel spread sheets"

Date	Timing	Course Instructor	Topic to be covered
07/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Flexibility Method of Analysis- Continuous beams with both ends fixed
08/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Flexibility Method of Analysis- Continuous beams with both ends fixed
09/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Flexibility Method of Analysis- Continuous beams with one ends fixed
10/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Flexibility Method of Analysis- Continuous beams with both ends hinged
11/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Flexibility Method of Analysis- Continuous beams with one side over hanging, both ends over hanging and with settlements at supports
12/09/20	9 AM to 1 PM	Prof. G. Sreenivasa Reddy	Stiffness method of Analysis- Continuous beams with both ends fixed, one ends fixed, both ends hinged.
14/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Stiffness method of Analysis- Continuous beams with one side over hanging, both ends over hanging and with settlements at supports.
15/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Introduction to Excel
16/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Excel Spreadsheet preparation for Flexibility Method of Analysis
17/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Excel Spreadsheet preparation for Flexibility Method of Analysis
18/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Excel Spreadsheet preparation for Flexibility Method of Analysis
19/09/20	9 AM to 1 PM	Prof. G. Sreenivasa Reddy	Excel Spreadsheet preparation for Stiffness of Analysis
21/09/20	4 PM to 6 PM	Prof. G. Sreenivasa Reddy	Excel Spreadsheet preparation for Stiffness of Analysis

V. S. S. Murthy

Principal

Instructor:

Coordinator:

C. Neela

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Report of

Certification Course on Design of continuous beams using Microsoft Excel spread sheets

From 07/09/20 to 21/09/20

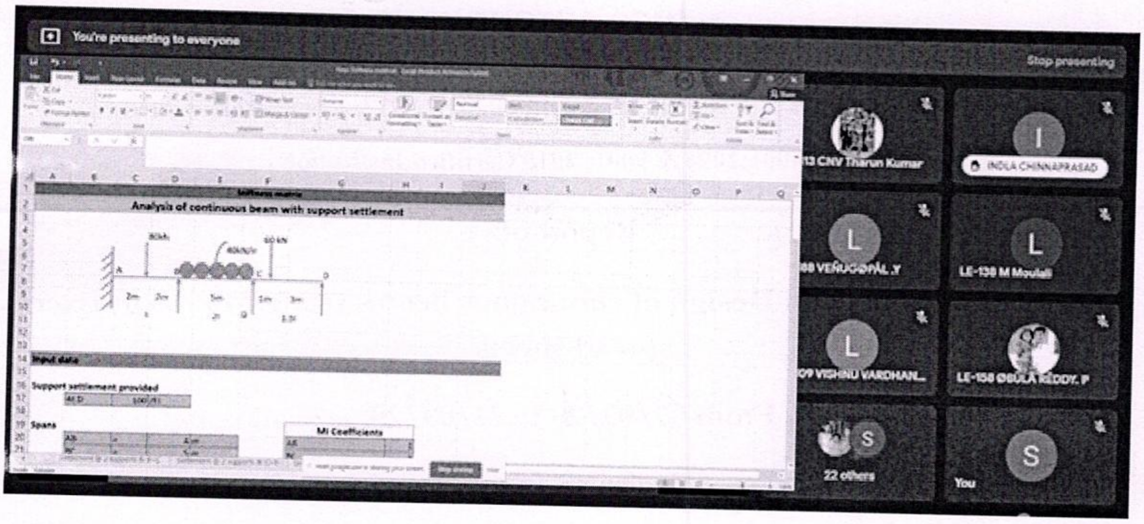
Target Group	:	**Students**
Details of Participants	:	**45 Students**
Co-coordinator(s)	:	**Sri. U. Arun Kumar and Miss. C. Neelima**
Organizing Department	:	**Civil Engineering**
Venue	:	**Online (google meet)**
		Link: https://meet.google.com/lookup/lwrndoa31h

Description:

The Department of Civil Engineering offered the Certification Course in "Design of continuous beams using Microsoft Excel spread sheets" from 07/09/20 to 21/09/20 and the course was organized for a total number of 30 hours. The course was instructed by Prof. G. Sreenivasa Reddy (Professor, Dept. Civil Engg.) and coordinated by Sri. U. Arun Kumar and Miss. C. Neelima (Assistant Professor, Dept. of Civil Engg.).

The present course mainly concentrated on analysis of continuous beams with various supports. Both Stiffness Method, Flexibility Method of Analysis were used to analyze- Continuous beams with both ends fixed, one end fixed, both ends hinged, one side over hanging, both ends over hanging and with settlements at supports. The course covers basics of Excel to write mathematical equations and to automate the Stiffness Method and Flexibility Method in Excel spread sheet.

Photo:



(Course Instructor)

(HoD, Civil Engg.)
Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

V. S. S. Murthy
Principal
PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
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DEPARTMENT OF CIVIL ENGINEERING

LIGHTED TO LIGHTEN

ESTD: 1980

Certificate Course

on

"Design of Continuous Beams using Microsoft Excel Spread Sheets"

Resource Person

Prof. G Sreenivasa Reddy

Department of Civil Engineering

07-09-2020

21-09-2020

Coordinators:

U. Arun Kumar, Miss C. Neelima

Assistant Professor, CED, KSRMCE

Department of Civil Engineering

Attendance sheet of Certification course on Design of continuous beams using Microsoft Excel spread sheets

Sl. No.	Student Roll No.	Student Name	07/09	08/09	09/09	10/09	11/09	12/09	14/09	15/09	16/09	17/09	18/09	19/09	21/09
1	189Y1A0126	Venkata Jithendhar Reddy Duddekunta	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	A	✓
2	189Y1A0132	Lakshmi Prasad Reddy Guddila	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	189Y1A0134	Nitheesh Gunigari	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	189Y1A0135	Sreeveni Hasti	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	189Y1A0144	Bhanumanikanta Reddy Kannapu	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	189Y1A0146	Govardhan Kaveti	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	189Y1A0156	Sudheer Kumar Maadam	✓	✓	A	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
8	189Y1A0158	Lokeshwar Reddy Mallireddy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	189Y1A0159	Ganesh Mandla	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
10	189Y1A0163	Sampath Kumar Meka			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
11	189Y1A0166	Siva Prasad Reddy Mitta	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓
12	189Y1A0171	Venkata Sai Poojith Nagalla Pati	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	189Y1A0172	Venkatesh Nagirikanti	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
14	189Y1A0175	Abhish Nanubala	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A

15	189Y1A0179	Jayachandra Sai Pandugolu	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	A	A
16	189Y1A0187	Rakesh Prasanna Penubala	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17	189Y1A0193	Bindhu Rachamallu	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18	189Y1A0195	Swarna Latha Seelam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
19	189Y1A0198	Afroz Shaik	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓
20	189Y1A01B0	Sateesh Kumar Reddy Thallapalle	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21	189Y1A01B4	Gayathri Thopudurthy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
22	189Y1A01B8	Venkata Hemanth Usugari	✓	✓	✓	✓	A	✓	✓	A	✓	✓	✓	✓	✓
23	189Y1A01C3	Ganga Swetha Vennapusa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
24	189Y1A01C6	Naga Hema Pranitha Sree Yelikanti	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
25	189Y1A01C8	Sivanatha Reddy Yeturu	✓	A	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
26	199Y5A0107	Vijay Kumar Reddy Basireddygari	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓
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28	199Y5A0109	Mahesh Naik Bukke	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
29	199Y5A0112	Mahesh Babu Chinthakunta	✓	✓	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
30	199Y5A0116	Pavan Kalyan Dokka	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

31	199Y5A0117	Dastagiri Dudekula	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
32	199Y5A0118	Premaraju Erapogu	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
33	199Y5A0123	Ramu Gosetty	✓	✓		✓	✓	A	✓	✓	✓	A	✓	✓	✓
34	199Y5A0125	Venkateshwarlu Judam	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
35	199Y5A0127	Venkateswarlu Kashetty	✓	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓
36	199Y5A0130	Vinodkumar Madhuranthakam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
37	199Y5A0131	Bharath Venkata Sai Malle Bharath	A	✓	✓	✓	A	✓	A	✓	✓	✓	✓	A	✓
38	199Y5A0132	Mahesh Mallepogu Budigi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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44	199Y5A0152	Mohammad Arief Shaik	✓	✓	A	✓	✓	✓	A	✓	✓	✓	✓	A	✓
45	199Y5A0155	Sravani Sirigiri	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
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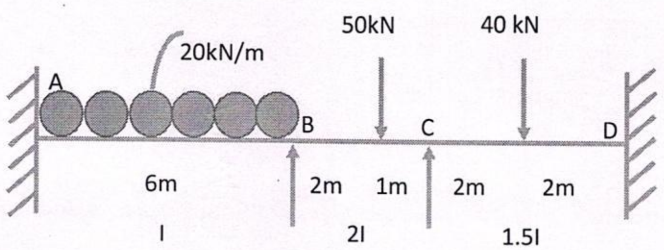
Stiffness method

Analysis of continuous beam with both ends fixed



Input data

Spans

AB	=	6	m
BC	=	3	m
CD	=	4	m

MI coefficents	
AB	1
BC	2
CD	1.5

Loads

on	AB	UDL	20	kN/M	NA	=	3	m
on	BC	Pointload	50	kN	Dist. from left end	=	2	m
on	CD	Pointload	40	kN	Dist. from left end	=	2	m

Step-1 Fixed end moments

M^F_{AB}	=	-60.00	kN-m
M^F_{BA}	=	60.00	kN-m
M^F_{BC}	=	-11.11	kN-m
MF_{CB}	=	22.22	kN-m
M^F_{CD}	=	-20.00	kN-m
M^F_{DC}	=	20.00	kN-m

Step-2 R and R_F Matrix

R Matrix will exists only if you have load (i.e.moment) at the coordinate system

R	=	0

R1	=	0	kN-m
R2	=	0	kN-m

Net fixed end moment at coordinates

R_{F1}	$= M^F_{BA} + M^F_{BC}$	=	48.9	kN-m

R_{F2}	$= M_{CB}^F + M_{CD}^F$	=	2.22	kN-m

$R\text{-}R_{F\,Matrix}$

R_1-R_{F1}	=	-48.9	kN-m
R_2-R_{F2}	=	-2.22	kN-m

Step-3 Stiffness Matrix

S_{11}	=	3.33	EI
S_{21}	=	1.33	EI
S_{12}	=	1.33	EI
S_{22}	=	4.17	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

$$S_{21} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	3.33	1.33
			1.33	4.17

S^{-1}	=	1/EI	0.34	-0.11
			-0.11	0.28

Unknown Displacements

$$D = S^{-1}\{R - R_f\}$$

Θ_A	=	0	/EI
Θ_B	=	-16.57	/EI
Θ_c	=	4.77	/EI
Θ_D	=	0	/EI

Final Moments

M_{AB}	=	-65.52	KN/m
M_{BA}	=	48.95	KN/m
M_{BC}	=	-48.95	KN/m
M_{CB}	=	12.84	KN/m
M_{CD}	=	-12.84	KN/m
M_{DC}	=	23.58	KN/m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	90.00	kN-m
In span	BC	M_{max}	=	33.33	kN-m
In span	CD	M_{max}	=	40.00	kN-m

Reactions at supports

For span AB

RB1	57.24	KN
RA	62.76	KN

For span BC

RC1	21.30	KN
RB2	28.70	KN

For span CD

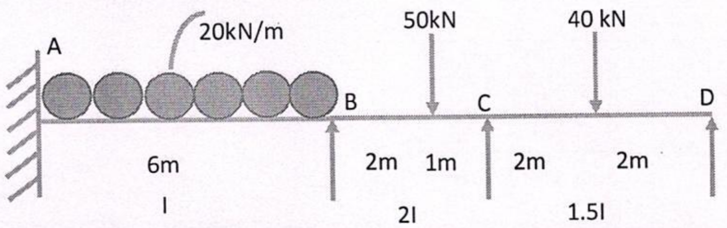
RD	22.68	KN
RC2	17.32	KN

Final Reactions

R_A	62.76	KN
R_B	85.94	KN
R_C	38.61	KN
R_D	22.68	KN

stiffness method

Analysis of continuous beam with one end fixed and other end hinged



Input data

Spans

AB	=	6	M
BC	=	3	M
CD	=	4	M

MI coefficents	
AB	1
BC	2
CD	1.5

Loads

on	AB	UDL	20	KN/M	NA	=	3
on	BC	Pointload	50	KN	Dist. from left end	=	2
on	CD	Pointload	40	KN	Dist. from left end	=	2

Step-1 Fixed end moments

M^F_{AB}	=	-60.00	kN-M
M^F_{BA}	=	60.00	kN-M
M^F_{BC}	=	-11	kN-M
MF_{CB}	=	22.22	kN-M
M^F_{CD}	=	-20	kN-M
M^F_{DC}	=	20	kN-M

Step-2 R and RF matrix

R Matrix will exists only if you have load (i.e.moment) at the coordinate system

R	=	0

R1	=	0
R2	=	0
R3	=	0

Net fixed end moment at coordinates

R_{F1}	$= M_{BA}^F + M_{BC}^F$	=	48.9	kN-m
R_{F2}	$= M_{CB}^F + M_{CD}^F$	=	2.22	kN-m
RF4	$= M_{DC}^F$	=	20.00	kN-m

$R-R_f$ matrix

R_1-R_{F1}	=	-48.9	kN-m
R_2-R_{F2}	=	-2.22222	kN-m
R_3-R_{F3}	=	-20	kN-m

Step-3 Stiffness Matrix

1st column

S_{11}	=	3.33	EI
S_{21}	=	1.33	EI
S_{31}	=	0	EI

2nd column

S_{12}	=	1.33	EI
S_{22}	=	4.17	EI
S_{32}	=	0.75	EI

3rd column

S_{13}	=	0	EI
S_{23}	=	0.75	EI
S_{33}	=	1.50	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{CD}$$

$$S_{33} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	3.33	1.33	0
			1.33	4.17	0.75
			0	0.75	1.50

Step 4 Displacement matrix

$$D = S^{-1}\{R - R_f\}$$

θ_A	=	0	1/EI
θ_B	=	-18	1/EI
θ_C	=	8.4	1/EI
θ_D	=	-17.5	1/EI

Step 5 Final moments

M_{AB}	=	-66	KN/m
M_{BA}	=	48	KN/m
M_{BC}	=	-48	KN/m
M_{CB}	=	20.6	KN/m
M_{CD}	=	-20.6	KN/m
M_{DC}	=	0	KN/m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	90.00	kN-m
In span	BC	M_{max}	=	33.33	kN-m
In span	CD	M_{max}	=	40.00	kN-m

Reactions at supports

For span AB

RB1	57.00	KN
RA	63.00	KN

For span BC

RC1	24.19	KN
RB2	25.81	KN

For span CD

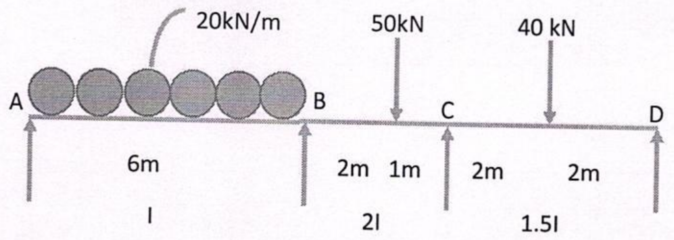
RD	14.86	KN
RC2	25.14	KN

Final Reactions

R_A	63.00	KN
R_B	82.80	KN
R_C	49.33	KN
R_D	14.86	KN

stiffness method

Anaysis of continuous beam with both ends hinged



Input data

Spans

AB	=	6	m
BC	=	3	m
CD	=	4	m

MI coefficents	
AB	1
BC	2
CD	1.5

Loads

on	AB	UDL	20	kN/m	NA	=	3	m
on	BC	Pointload	50	kN	Dist. from left end	=	2	m
on	CD	Pointload	40	kN	Dist. from left end	=	2	m

Step-1 Fixed end moments

M^F_{AB}	=	-60	KN-M
M^F_{BA}	=	60	KN-M
M^F_{BC}	=	-11.11	KN-M
MF_{CB}	=	22.22	KN-M
M^F_{CD}	=	-20	KN-M
M^F_{DC}	=	20	KN-M

Step-2 R and R_F matrix

R Matrix will exists only if you have load (i.e.moment) at the coordinate system

R	=	0

R_1	=	0
R_2	=	0
R_3	=	0
R_4	=	0

Net fixed end moment at coordinates

R_{F1}	=	M_{AB}^F	=	-60	kN/m
R_{F2}	=	$M_{BA}^F + M_{BC}^F$	=	48.9	kN/m
R_{F3}	=	$M_{CB}^F + M_{CD}^F$	=	2.22	kN/m
R_{F4}	=	M_{DC}^F	=	20.00	kN/m

R-R_f matrix

R_1-R_{F1}	=	60	kN/m
R_2-R_{F2}	=	-48.89	kN/m
R_3-R_{F3}	=	-2.22	kN/m
R_4-R_{F4}	=	-20	kN/m

Step-3 Stiffness Matrix

1st column

S_{11}	=	0.67	EI
S_{21}	=	0.33	EI
S_{31}	=	0	EI
S_{41}	=	0	EI

2nd column

S_{12}	=	0.33	EI
S_{22}	=	3.33	EI
S_{32}	=	1.33	EI
S_{42}	=	0	EI

3rd column

S_{13}	=	0	EI
S_{23}	=	1.33	EI
S_{33}	=	4.17	EI
S_{43}	=	0.75	EI

4th column

S_{14}	=	0	EI
S_{24}	=	0	EI
S_{34}	=	0.75	EI
S_{44}	=	1.5	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{AB}$$

$$S_{22} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{BC}$$

$$S_{33} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{43} = S_{34} = \left(\frac{2EI}{L}\right)_{CD}$$

$$S_{44} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	0.67	0.33	0	0
			0.33	3.33	1.33	0
			0	1.33	4.17	0.75
			0	0	0.75	1.5

Step 4 Displacement matrix

θ_A	=	105.13	/EI
θ_B	=	-30.26	/EI
θ_C	=	12.69	/EI
θ_D	=	-19.68	/EI

Step 5 Final moments

M_{AB}	=	0	kN/m
M_{BA}	=	74.87	kN/m
M_{BC}	=	-74.87	kN/m
M_{CB}	=	15.72	kN/m
M_{CD}	=	-15.72	kN/m
M_{DC}	=	0	kN/m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	90.00	kN-m
In span	BC	M_{max}	=	33.33	kN-m
In span	CD	M_{max}	=	40.00	kN-m

Reactions at supports

For span AB

RB1	72.48	KN
RA	47.52	KN

For span BC

RC1	13.62	KN
RB2	36.38	KN

For span CD

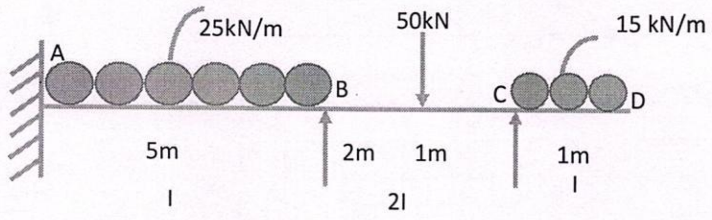
RD	16.07	KN
RC2	3.93	KN

Final Reactions

R_A	47.52	KN
R_B	108.86	KN
R_C	17.55	KN
R_D	16.07	KN

Stiffness method

Analysis of overhanging beam with other end fixed



Input data

Spans

AB	=	5	m
BC	=	4	m
CD	=	1	m

MI coefficents	
AB	1
BC	2
CD	1

Loads

on	AB	UDL	25	kN/m	NA	=	3	m
on	BC	Pointload	50	kN	Dist. from left end	=	3	m
on	CD	UDL	15	kN/m	NA	=	0.5	m

Step-1 Fixed end moments

M^F_{AB}	=	-52.08	kN-m
M^F_{BA}	=	52.08	kN-m
M^F_{BC}	=	-9.38	kN-m
MF_{CB}	=	28.13	kN-m
M^F_{CD}	=	-7.50	kN-m

Step-2 R and R_F Matrix

Since at "Node 2" there is a load (i.e.moment) at the coordinate system of value,

R2	=	7.50	kN-m

we know that,

R1	=	0	kN-m

Net fixed end moment at coordinates

R_{F1}	=	42.71	kN-m
R_{F2}	=	20.63	kN-m

R-$R_{F\ Matrix}$

R_1-R_{F1}	=	-42.7	kN-m
R_2-R_{F2}	=	-13.13	kN-m

Step-3 Stiffness Matrix

S_{11}	=	2.80	EI
S_{21}	=	1.00	EI
S_{12}	=	1.00	EI
S_{22}	=	2.00	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC}$$

S	=	EI	2.80	1.00
			1.00	2.00

S^{-1}	=	1/EI	0.43	-0.22
			-0.22	0.61

Unknown Displacements

Θ_A	=	0	/EI
Θ_B	=	-15.72	/EI
Θ_c	=	1.30	/EI
Θ_D	=	0	/EI

Final Moments

M_{AB}	=	-58.37	KN/m
M_{BA}	=	39.51	KN/m
M_{BC}	=	-39.51	KN/m
M_{CB}	=	15.00	KN/m
M_{CD}	=	-7.50	KN/m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	78.13	kN-m
In span	BC	M_{max}	=	37.50	kN-m
In span	CD	M_{max}	=	7.50	kN-m

Reactions at supports

For span AB

R_{B1}	58.73	kN-m
R_A	66.27	kN-m

For span BC

R_{C1}	31.37	kN-m
R_{B2}	18.63	kN-m

For span CD

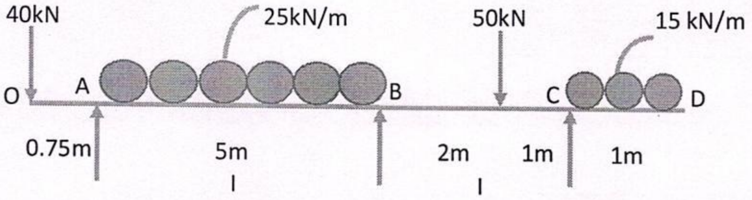
R_{C2}	15.00	kN-m

Final Reactions

R_A	66.27	KN
R_B	77.36	KN
R_C	46.37	KN

Stiffness method

Analysis of continuous beam with both sides overhanging



Input data

Spans

OA	=	0.75	m
AB	=	5	m
BC	=	3	m
CD	=	1	m

MI Coefficients	
AB	1
BC	1

Loads

on	OA	Point load	40	KN	Distance from left end	=	0	m
on	AB	UDL	25	KN/m	NA	=	2.5	m
on	BC	Point load	50	KN	Distance from left end	=	2	m
on	CD	UDL	15	KN/m	NA	=	0.5	m

Step-1 Fixed end Moments

M^F_{AO}	=	30	kN-m
M^F_{AB}	=	-52.08	kN-m
M^F_{BA}	=	52.08	kN-m
M^F_{BC}	=	-11.11	kN-m
M^F_{CB}	=	22.22	kN-m
M^F_{CD}	=	-7.5	kN-m

Step-2 R and RF Matrix

R Matrix will exists as you have load (i.e. moment) at the coordinate system

R_1	=	30	Kn m
R_2	=	0	Kn m
R_3	=	7.5	Kn m

Net fixed end moment at coordinates

R_{F1}	$= M^F_{AB}$	-52.08	kN-m
R_{F2}	$= M^F_{BA} + M^F_{BC}$	40.97	kN-m
R_{F3}	$= M^F_{CB} + M^F_{CD}$	22.22	kN-m

R-R_{F} Matrix

R_1-R_{F1}	=	82.08	kN-m
R_2-R_{F2}	=	-40.97	kN-m
R_3-R_{F3}	=	-14.72	kN-m

Step-3 Stiffness Matrix

1st column

S_{11}	=	0.80	EI
S_{21}	=	0.40	EI
S_{31}	=	0	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{AB}$$

2nd column

S_{12}	=	0.40	EI
S_{22}	=	2.13	EI
S_{32}	=	0.67	EI

$$S_{22} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{BC}$$

3rd column

S_{13}	=	0	EI
S_{23}	=	0.67	EI
S_{33}	=	1.33	EI

$$S_{33} = \left(\frac{4EI}{L}\right)_{BC}$$

S	=	EI	0.80	0.40	0
			0.40	2.13	0.67
			0	0.67	1.33

Unknown displacements

θ_A	=	125.93	/EI
θ_B	=	-46.66	/EI
θ_C	=	12.29	/EI

Final moments

M_{AO}	=	30	KN-m
M_{AB}	=	30	KN-m
M_{BA}	=	65.13	KN-m
M_{BC}	=	-65.13	KN-m
M_{CB}	=	7.5	KN-m
M_{CD}	=	-7.5	KN-m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	OA	M_{max}	=	11.25	kN-m
In span	AB	M_{max}	=	78.13	kN-m
In span	BC	M_{max}	=	56.25	kN-m
In span	CD	M_{max}	=	7.50	kN-m

Reactions at supports

For span OA

R_{A1}	40	kN-m

For span AB

R_{B1}	81.53	kN-m
R_{A2}	43.47	kN-m

For span BC

R_{C1}	55.79	kN-m
R_{B2}	-5.79	kN-m

For span CD

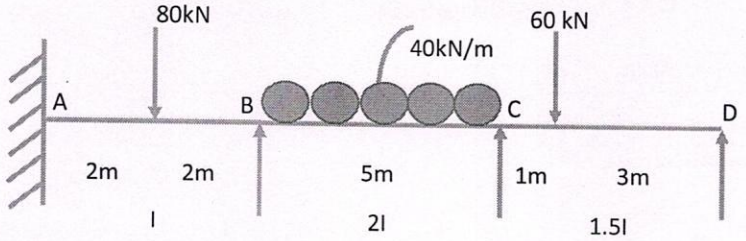
R_{C2}	15.00	kN-m

Final Reactions

R_A	83.47	KN
R_B	75.74	KN
R_C	70.79	KN

Stiffness matrix

Analysis of continuous beam with support settlement



Input data

Support settlement provided

At B	100	/EI
At C	75	/EI

Spans

AB	=	4	m
BC	=	5	m
CD	=	4	m

MI Coefficients

AB	1
BC	2
CD	1.5

Loads

on	AB	Point load	80	KN	Distance from left end	=	2	m
on	BC	UDL	40	KN/m	NA	=	2.5	m
on	CD	Point load	60	KN	Distance from left end	=	1	m

Step-1 Fixed end Moments

M^F_{AB}	=	-40	kN-m
M^F_{BA}	=	40	kN-m
M^F_{BC}	=	-83.33	kN-m
M^F_{CB}	=	83.33	kN-m
M^F_{CD}	=	-33.75	kN-m
M^F_{DC}	=	11.25	kN-m

Fixed end moments due to support setlement

M^1_{AB}	=	-37.5	Kn-m
M^1_{BA}	=	-37.5	Kn-m
M^1_{BC}	=	6	Kn-m
M^1_{CB}	=	6	Kn-m
M^1_{CD}	=	28.13	Kn-m
M^1_{DC}	=	28.13	Kn-m

Step-2 R and R_F Matrix

R matrix is zero since the moment is not at the coordinate system

R_1	=	0
R_2	=	0
R_3	=	0

Net fixed end moment at coordinates

R_{F1}	$= M_{BA}^F + M^F_{BC} + M^I_{BA} + M^I_{BC}$	-74.83	kN-m
R_{F2}	$= M_{CB}^F + M_{CD}^F + M^I_{CB} + M^I_{CD}$	83.71	kN-m
R_{F3}	$= M^F_{DC} + M^I_{DC}$	39.38	kN-m

R-R_F matrix

R_1-R_{F1}	=	74.83	kN m
R_2-R_{F2}	=	-83.71	kN m
R_3-R_{F3}	=	-39.38	kN m

Step-3 Stiffness Matrix

1st column

S_{11}	=	2.60	EI
S_{21}	=	0.80	EI
S_{31}	=	0	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

2nd column

S_{12}	=	0.80	EI
S_{22}	=	3.10	EI
S_{32}	=	0.75	EI

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{CD}$$

3rd column

S_{13}	=	0	EI
S_{23}	=	0.75	EI
S_{33}	=	1.50	EI

$$S_{33} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	2.60	0.80	0
			0.80	3.10	0.75
			0	0.75	1.50

Unknown displacements

θ_A	0	/EI
θ_B	39.586889	/EI
θ_C	-35.11572	/EI
θ_D	-8.692139	/EI

Final Moments

M_{AB}	=	-57.71	kN-m
M_{BA}	=	42.09	kN-m
M_{BC}	=	-42.09	kN-m
M_{CB}	=	64.82	kN-m
M_{CD}	=	-64.82	kN-m
M_{DC}	=	0	kN-m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	80.00	kN-m
In span	BC	M_{max}	=	125.00	kN-m
In span	CD	M_{max}	=	45.00	kN-m

Reactions at supports

For span AB

RB1	36.10	KN
RA	43.90	KN

For span BC

RC1	104.55	KN
RB2	95.45	KN

For span CD

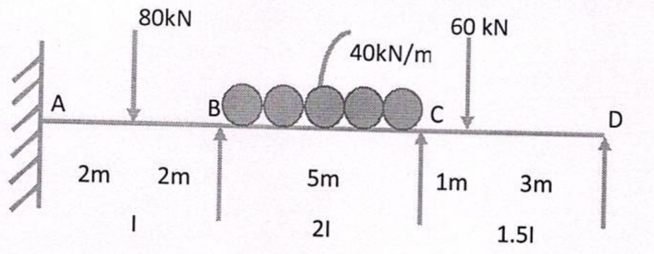
RD	-1.20	KN
RC2	61.20	KN

Final Reactions

R_A	43.90	KN
R_B	131.55	KN
R_C	165.75	KN
R_D	-1.20	KN

Stiffness matrix

Analysis of continuous beam with support settlement



Input data

Support settlement provided

At B	75	/EI
At C	100	/EI

Spans

AB	=	4	m
BC	=	5	m
CD	=	4	m

MI Coefficients	
AB	1
BC	2
CD	1.5

Loads

on	AB	Point load	80	KN	Distance from left end	=	2	m
on	BC	UDL	40	KN/m	NA	=	2.5	m
on	CD	Point load	60	KN	Distance from left end	=	1	m

Step-1 Fixed end Moments

M^F_{AB}	=	-40	kN-m
M^F_{BA}	=	40	kN-m
M^F_{BC}	=	-83.33	kN-m
M^F_{CB}	=	83.33	kN-m
M^F_{CD}	=	-33.75	kN-m
M^F_{DC}	=	11.25	kN-m

Fixed end moments due to support setlement

M^1_{AB}	=	-28.125	Kn-m
M^1_{BA}	=	-28.125	Kn-m
M^1_{BC}	=	6	Kn-m
M^1_{CB}	=	6	Kn-m
M^1_{CD}	=	37.50	Kn-m
M^1_{DC}	=	37.50	Kn-m

Step-2 R and R_F Matrix

R matrix is zero since the moment is not at the coordinate system

R_1	=	0
R_2	=	0
R_3	=	0

Net fixed end moment at coordinates

R_{F1}	$= M^F_{BA} + M^F_{BC} + M^l_{BA} + M^l_{BC}$	-65.46	kN-m
R_{F2}	$= M^F_{CB} + M^F_{CD} + M^l_{CB} + M^l_{CD}$	93.08	kN-m
R_{F3}	$= M^F_{DC} + M^l_{DC}$	48.75	kN-m

$R-R_F$ matrix

R_1-R_{F1}	=	65.46	kN m
R_2-R_{F2}		-93.08	kN m
R_3-R_{F3}		-48.75	kN m

Step-3 Stiffness Matrix

1st column

S_{11}	=	2.60	EI
S_{21}	=	0.80	EI
S_{31}	=	0	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

2nd column

S_{12}	=	0.80	EI
S_{22}	=	3.10	EI
S_{32}	=	0.75	EI

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{CD}$$

3rd column

S_{13}	=	0	EI
S_{23}	=	0.75	EI
S_{33}	=	1.50	EI

$$S_{33} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	2.60	0.80	0
			0.80	3.10	0.75
			0	0.75	1.50

Unknown displacements

θ_A	0	/EI
θ_B	36.20491	/EI
θ_C	-35.843	/EI
θ_D	-14.5785	/EI

Final Moments

M_{AB}	=	-50.02	kN-m
M_{BA}	=	48.08	kN-m
M_{BC}	=	-48.08	kN-m
M_{CB}	=	60.95	kN-m
M_{CD}	=	-60.95	kN-m
M_{DC}	=	0	kN-m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	80.00	kN-m
In span	BC	M_{max}	=	125.00	kN-m
In span	CD	M_{max}	=	45.00	kN-m

Reactions at supports

For span AB

RB1	39.51	KN
RA	40.49	KN

For span BC

RC1	102.57	KN
RB2	97.43	KN

For span CD

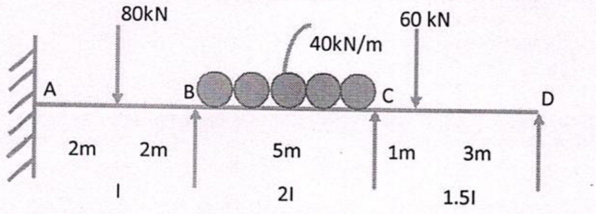
RD	-0.24	KN
RC2	60.24	KN

Final Reactions

R_A	40.49	KN
R_B	136.94	KN
R_C	162.81	KN
R_D	-0.24	KN

Stiffness matrix

Analysis of continuous beam with support settlement



Input data

Support settlement provided

At A	75	/EI

Spans

AB	=	4	m
BC	=	5	m
CD	=	4	m

MI Coefficients	
AB	1
BC	2
CD	1.5

Loads

on	AB	Point load	80	KN	Distance from left end	=	2	m
on	BC	UDL	40	KN/m	NA	=	1	m
on	CD	Point load	60	KN	Distance from left end	=	1	m

Step-1 Fixed end Moments

M^F_{AB}	=	-40	kN-m
M^F_{BA}	=	40	kN-m
M^F_{BC}	=	-83.33	kN-m
M^F_{CB}	=	83.33	kN-m
M^F_{CD}	=	-33.75	kN-m
M^F_{DC}	=	11.25	kN-m

Fixed end moments due to support setlement

M^1_{AB}	=	-28.125	Kn-m
M^1_{BA}	=	-28.125	Kn-m

Step-2 R and R_F Matrix

R matrix is zero since the moment is not at the coordinate system

R_1	=	0
R_2	=	0
R_3	=	0

Net fixed end moment at coordinates

R_{F1}	$= M^F_{BA} + M^F_{BC} + M^1_{BA}$	-71.46	kN-m
R_{F2}	$= M^F_{CB} + M^F_{CD}$	49.58	kN-m
R_{F3}	$= M^F_{DC}$	11.25	kN-m

R-R_F matrix

R_1-R_{F1}	=	71.46	kN m
R_2-R_{F2}	=	-49.58	kN m
R_3-R_{F3}	=	-11.25	kN m

Step-3 Stiffness Matrix

1st column

S_{11}	=	2.60	EI
S_{21}	=	0.80	EI
S_{31}	=	0	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

2nd column

S_{12}	=	0.80	EI
S_{22}	=	3.10	EI
S_{32}	=	0.75	EI

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{CD}$$

3rd column

S_{13}	=	0	EI
S_{23}	=	0.75	EI
S_{33}	=	1.50	EI

$$S_{33} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	2.60	0.80	0
			0.80	3.10	0.75
			0	0.75	1.50

Unknown displacements

θ_A	0	/EI
θ_B	35.669608	/EI
θ_C	-26.60331	/EI
θ_D	5.801655	/EI

Final Moments

M_{AB}	=	-50.29	kN-m
M_{BA}	=	47.54	kN-m
M_{BC}	=	-47.54	kN-m
M_{CB}	=	69.30	kN-m
M_{CD}	=	-69.30	kN-m
M_{DC}	=	0	kN-m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	80.00	kN-m
In span	BC	M_{max}	=	125.00	kN-m
In span	CD	M_{max}	=	45.00	kN-m

Reactions at supports

For span AB

RB1	39.31	KN
RA	40.69	KN

For span BC

RC1	104.35	KN
RB2	95.65	KN

For span CD

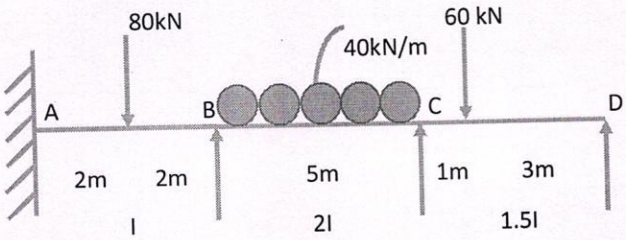
RD	-2.33	KN
RC2	62.33	KN

Final Reactions

R_A	40.69	KN
R_B	134.96	KN
R_C	166.68	KN
R_D	-2.33	KN

Stiffness matrix

Analysis of continuous beam with support settlement



Input data

Support settlement provided

At D	100	/EI

Spans

AB	=	4	m
BC	=	5	m
CD	=	4	m

MI Coefficients	
AB	1
BC	2
CD	1.5

Loads

on	AB	Point load	80	KN	Distance from left end	=	2	m
on	BC	UDL	40	KN/m	NA	=	1	m
on	CD	Point load	60	KN	Distance from left end	=	1	m

Step-1 Fixed end Moments

M^F_{AB}	=	-40	kN-m
M^F_{BA}	=	40	kN-m
M^F_{BC}	=	-83.33	kN-m
M^F_{CB}	=	83.33	kN-m
M^F_{CD}	=	-33.75	kN-m
M^F_{DC}	=	11.25	kN-m

Fixed end moments due to support setlement

M^1_{CD}	=	37.50	Kn-m
M^1_{DC}	=	37.50	Kn-m

Step-2 R and R_F Matrix

R matrix is zero since the moment is not at the coordinate system

R_1	=	0
R_2	=	0
R_3	=	0

Net fixed end moment at coordinates

R_{F1}	$= M^F_{BA} + M^F_{BC}$	-43.33	kN-m
R_{F2}	$= M^F_{CB} + M^F_{CD} + M^I_{CD}$	87.08	kN-m
R_{F3}	$= M^F_{DC} + M^I_{DC}$	48.75	kN-m

$R\text{-}R_F$ matrix

$R_1\text{-}R_{F1}$	=	43.33	kN m
$R_2\text{-}R_{F2}$	=	-87.08	kN m
$R_3\text{-}R_{F3}$	=	-48.75	kN m

Step-3 Stiffness Matrix

1st column

S_{11}	=	2.60	EI
S_{21}	=	0.80	EI
S_{31}	=	0	EI

$$S_{11} = \left(\frac{4EI}{L}\right)_{AB} + \left(\frac{4EI}{L}\right)_{BC}$$

$$S_{21} = S_{12} = \left(\frac{2EI}{L}\right)_{BC}$$

2nd column

S_{12}	=	0.80	EI
S_{22}	=	3.10	EI
S_{32}	=	0.75	EI

$$S_{22} = \left(\frac{4EI}{L}\right)_{BC} + \left(\frac{4EI}{L}\right)_{CD}$$

$$S_{32} = S_{23} = \left(\frac{2EI}{L}\right)_{CD}$$

3rd column

S_{13}	=	0	EI
S_{23}	=	0.75	EI
S_{33}	=	1.50	EI

$$S_{33} = \left(\frac{4EI}{L}\right)_{CD}$$

S	=	EI	2.60	0.80	0
			0.80	3.10	0.75
			0	0.75	1.50

Unknown displacements

θ_A	0	/EI
θ_B	26.10551	/EI
θ_C	-30.6762	/EI
θ_D	-17.1619	/EI

Final Moments

M_{AB}	=	-26.95	kN-m
M_{BA}	=	66.11	kN-m
M_{BC}	=	-66.11	kN-m
M_{CB}	=	55.14	kN-m
M_{CD}	=	-55.14	kN-m
M_{DC}	=	0	kN-m

Shear Force and Bending Moment Diagram

Simply Supported Beam moments

In span	AB	M_{max}	=	80.00	kN-m
In span	BC	M_{max}	=	125.00	kN-m
In span	CD	M_{max}	=	45.00	kN-m

Reactions at supports

For span AB

RB1	49.79	KN
RA	30.21	KN

For span BC

RC1	97.81	KN
RB2	102.19	KN

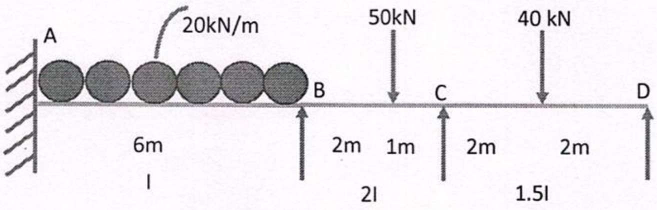
For span CD

RD	1.22	KN
RC2	58.78	KN

Final Reactions

R_A	30.21	KN
R_B	151.98	KN
R_C	156.59	KN
R_D	1.22	KN

Flexibity matrix



Input data

Spans

AB	=	6	m
BC	=	3	m
CD	=	4	m

MI coefficents	
AB	1
BC	2
CD	1.5

Loads

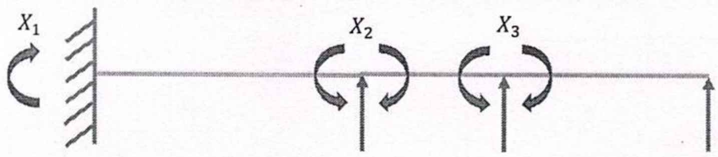
on	AB	UDL	20	kN/m	NA	=	3	m
on	BC	Pointload	50	kN	Dist. from left end	=	2	m
on	CD	Pointload	40	kN	Dist. from left end	=	2	m

Static indeterminacy

S.I	=	3

Step-1 Coordinate system released

Inorder to make the structure determinate release 3 unknown forces (M_A,R_B,R_C).



Step-2 Flexibility matrix

To develop the first column of the flexibility matrix, apply a unit force(moment) at cordinate 1

f_{11}	$=\left(\frac{L}{3EI}\right)_{AB}$	=	2	/EI
f_{21}	$=\left(\frac{L}{6EI}\right)_{AB}$	=	1	/EI
f_{31}		=	0	/EI

To develop the second column of the flexibility matrix, apply a unit force(moment) at cordinate 2

f_{12}	$=\left(\frac{L}{6EI}\right)_{AB}$	=	1	/EI
f_{22}	$=\left(\frac{L}{3EI}\right)_{AB}+\left(\frac{L}{3EI}\right)_{BC}$	=	2.5	/EI
f_{32}	$=\left(\frac{L}{6EI}\right)_{BC}$	=	0.25	/EI

To develop the third column of the flexibility matrix, apply a unit force(moment) at cordinate 3

f_{13}		=	0	/EI
f_{23}	$=\left(\frac{L}{6EI}\right)_{BC}$	=	0.25	/EI
f_{33}	$=\left(\frac{L}{3EI}\right)_{BC}+\left(\frac{L}{3EI}\right)_{CD}$	=	1.39	/EI

Flexibility matrix

f	=	1/EI	2	1	0
			1	2.5	0.25
			0	0.25	1.39

Step- 3 Displacement matrix

Displacement at the cordinate 1, due to applied loading

D_{P1}	$=\theta_{AB}$	$=\left(\frac{wl^3}{24EI}\right)$	=	180	EI
D_{P2}	$=\theta_{BA}+\theta_{BC}$	$=\left(\frac{wl^3}{24EI}\right)+\left(\frac{wb(l^2-b^2)}{6EIL}\right)$	=	191.11	EI
D_{P3}	$=\theta_{CB}+\theta_{CD}$	$=\left(\frac{wa(l^2-a^2)}{6EIL}\right)+\left(\frac{wl^2}{16EI}\right)$	=	40.56	EI

Displacement matrix

DP	=	EI	180
			191.11
			40.56

Step-4 Final moments matrix

$$[X_R] = [f]^{-1} * [D_p]$$

X_R	=	66.01	kN-m
		47.99	kN-m
		20.56	kN-m

Final moments

M_A	=	66.01	kN-m
M_B	=	47.99	kN-m
M_C	=	20.56	kN-m

K.S.R.M College of Engineering

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KADAPA, ANDHRA PRADESH, INDIA-516003

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DEPARTMENT OF CIVIL ENGINEERING

CERTIFICATE OF COURSE COMPLETION

This certificate is presented to

Govardhan K. (Reg. No. 189Y1A0146), Student of KSRM College of Engineering (Autonomous) for successful completion of certification course on "Design of continuous beams using Microsoft Excel spread sheets" offered by Department of civil Engineering, KSRMCE-Kadapa.

Course Duration: 30 Hours;
From 07/09/20 to 21/09/20

Course Instructor:
Prof. G. Sreenivasa Reddy,
Professor, CE, KSRMCE-Kadapa

Coordinator | Head of the Department | Principal

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Jayachandra Sai P. (Reg. No. 189Y1A0179), Student of KSRM College of Engineering (Autonomous) for successful completion of certification course on "Design of continuous beams using Microsoft Excel spread sheets" offered by Department of civil Engineering, KSRMCE-Kadapa.

Course Duration: 30 Hours;
From 07/09/20 to 21/09/20

Course Instructor:
Prof. G. Sreenivasa Reddy,
Professor, CE, KSRMCE-Kadapa

Coordinator

Head of the Department

Principal

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Swarna L. S. (Reg. No. 189Y1A0195). Student of KSRM College of Engineering (Autonomous) for successful completion of certification course on "**Design of continuous beams using Microsoft Excel spread sheets**" offered by Department of civil Engineering, KSRMCE-Kadapa.

Course Duration: 30 Hours;
From 07/09/20 to 21/09/20

Course Instructor:
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Professor, CE, KSRMCE-Kadapa

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This certificate is presented to

Sateesh Kumar Reddy T. (Reg. No. 189Y1A01B0), Student of KSRM College of Engineering (Autonomous) for successful completion of certification course on "Design of continuous beams using Microsoft Excel spread sheets" offered by Department of civil Engineering, KSRMCE-Kadapa.

Course Duration: 30 Hours;
From 07/09/20 to 21/09/20

Course Instructor:
Prof. G. Sreenivasa Reddy,
Professor, CE, KSRMCE-Kadapa

Coordinator | Head of the Department | Principal

Department of Civil Engineering

Feedback of students on Certification Course on "Design of continuous beams using Microsoft Excel spread sheets"

Sl. No.	Roll. No.	Name of The Student	Do you understand the Flexibility & Stiffness method?	Can you use Excel and solve basic beam analysis problems?	Are the lecture hours sufficient to cover the course?	Rate the course instructor	Rate the entire course?
1	189Y1A0126	Venkata Jithendhar Reddy Duddekunta	Yes	Yes	Yes	Excellent	5
2	189Y1A0132	Lakshmi Prasad Reddy Guddila	Yes	Yes	Yes	Excellent	5
3	189Y1A0134	Nitheesh Gunigari	Yes	Yes	Yes	Excellent	5
4	189Y1A0135	Sreeveni Hasti	Yes	Yes	Yes	Excellent	5
5	189Y1A0144	Bhanumanikanta Reddy Kannapu	Yes	Yes	Yes	Excellent	5
6	189Y1A0146	Govardhan Kaveti	Yes	Yes	Yes	Excellent	5
7	189Y1A0156	Sudheer Kumar Maadam	Yes	Yes	Yes	Excellent	5
8	189Y1A0158	Lokeshwar Reddy Mallireddy	Yes	Yes	Yes	Excellent	5
9	189Y1A0159	Ganesh Mandla	Yes	Maybe	Yes	Excellent	5
10	189Y1A0163	Sampath Kumar Meka	Yes	Yes	Yes	Excellent	5
11	189Y1A0166	Siva Prasad Reddy Mitta	Yes	Yes	Yes	Excellent	5
12	189Y1A0171	Venkata Sai Poojith Nagalla Pati	Yes	Yes	Yes	Excellent	5
13	189Y1A0172	Venkatesh Nagirikanti	Yes	Yes	Yes	Excellent	5
14	189Y1A0175	Abhish Nanubala	Yes	Yes	Yes	Excellent	5
15	189Y1A0179	Jayachandra Sai Pandugolu	Yes	Yes	Yes	Excellent	5
16	189Y1A0187	Rakesh Prasanna Penubala	Yes	Yes	Yes	Excellent	5

17	189Y1A0193	Bindhu Rachamallu	Yes	Yes	Yes	Excellent	5
18	189Y1A0195	Swarna Latha Seelam	Yes	Yes	Yes	Excellent	5
19	189Y1A0198	Afroz Shaik	Yes	Yes	Yes	Excellent	5
20	189Y1A01B0	Sateesh Kumar Reddy Thallapalle	Yes	Yes	Yes	Excellent	5
21	189Y1A01B4	Gayathri Thopudurthy	Yes	Yes	Yes	Excellent	4
22	189Y1A01B8	Venkata Hemanth Usugari	Yes	Yes	Yes	Excellent	5
23	189Y1A01C3	Ganga Swetha Vennapusa	Yes	Yes	Yes	Good	5
24	189Y1A01C6	Naga Hema Pranitha Sree Yelikanti	Yes	Yes	Yes	Good	5
25	189Y1A01C8	Sivanatha Reddy Yeturu	Yes	Yes	Yes	Excellent	5
26	199Y5A0107	Vijay Kumar Reddy Basireddygari	Yes	Yes	Yes	Excellent	5
27	199Y5A0108	Sai Bonthalapalli	Yes	Yes	Yes	Excellent	5
28	199Y5A0109	Mahesh Naik Bukke	Yes	Yes	Yes	Excellent	5
29	199Y5A0112	Mahesh Babu Chinthakunta	Yes	Yes	Yes	Excellent	5
30	199Y5A0116	Pavan Kalyan Dokka	Yes	Yes	Yes	Good	4
31	199Y5A0117	Dastagiri Dudekula	Yes	Yes	Yes	Excellent	5
32	199Y5A0118	Premaraju Erapogu	Yes	Yes	Yes	Excellent	4
33	199Y5A0123	Ramu Gosetty	Yes	Yes	Yes	Excellent	5
34	199Y5A0125	Venkateshwarlu Judam	Yes	Yes	Yes	Excellent	5
35	199Y5A0127	Venkateswarlu Kashetty	Yes	Yes	Yes	Excellent	5
36	199Y5A0130	Vinodkumar Madhuranthakam	Yes	Yes	Yes	Excellent	5

37	199Y5A0131	Bharath Venkata Sai Malle Bharath	Yes	Yes	Yes	Excellent	5
38	199Y5A0132	Mahesh Mallepogu Budigi	Yes	Yes	Yes	Excellent	5
39	199Y5A0134	Sai Kumar Mannula	Yes	Yes	Yes	Excellent	4
40	199Y5A0138	Reddaiah Nagulugari	Yes	Yes	Yes	Excellent	5
41	199Y5A0144	Praveen Kumar Reddy Pathi	Yes	Yes	Yes	Good	5
42	199Y5A0149	Chandramouli Sambaturu	Yes	Yes	Yes	Excellent	5
43	199Y5A0150	Sambasivareddy Sanikommu	Yes	Yes	Yes	Excellent	5
44	199Y5A0152	Mohammad Arief Shaik	Yes	Yes	Yes	Excellent	5
45	199Y5A0155	Sravani Sirigiri	Yes	Yes	Yes	Excellent	5

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
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KADAPA 516 003. (A.P.)