INSTRUCTION FOR LECTURERS AND STUDENTS:

The primary aim of this homework in the form of the individual assignments is to help the student learn the laws of statics for analysis of statically determinate and indeterminate systems using equilibrium equations and different methods of analysis like as force method, displacement methods, ...

The first part deals with the statics to determine the internal forces in the statically determinate systems. Also, this part contains a lot of problems for determining the deflection and slope of different types of structures by using conjugated-beam and virtual work methods.

This section presents the problems that will allow the student to master the methods and techniques of drawing diagrams of the internal loads and influence lines in various complexity structures.

The second part is devoted to the determination of displacements (deflection and slope) of the structures under external loads.

The student must take the data according to individual code number from the tables for each problem respectively.

The student's code includes a six-digit number consisting of three parts – three code numbers. Each student at the beginning of the academic year, will receive his own individual three code numbers, according to this code, for all problems presented in this book, he/she will select a figure (I-first code), dimensions and geometric data (II-second code), and value of the applied loads to the structure (III-third code). Each part of the code is in the range 01-40. For each topic of the structural analysis presented forty figures. For Example, if the student's code number is **01 20 09**

$$\underbrace{01}_{I} \ \underbrace{20}_{II} \ \underbrace{09}_{III}$$

How to get data for problem No. 1?
  a) See the first column of the table your I-code is 01 hence you figure is 1:

Fig. 1
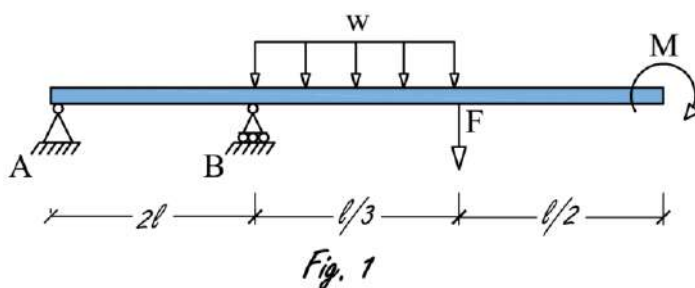
  b) Your II-code is 20, hence *l=5m*.

c) And III-code is 09, hence *F=10kN, w=5kN/m, M=12kN.m*.

Thus, there is all the necessary data to solve the problem No.1.

In the title of each report should be written: Student's code, name, problem number, name of subject, full name of student, department, college, and university. Each homework report should be carried out on A4 using ink pen (not red) or printed.

Before the solution of each problem student must write all data and condition with numeric data, draw a clear to scale sketch and demonstrate all data (dimensions, loads, …).

The solution must be clear and briefly, consistent and competent, and the result values should be shown in the tables or by figures and drawings. It is necessary to avoid wordy explanations and narration of the textbook. Students should know that the language of the engineer is the formula and drawing. When using formulas or data missing in the tutorial, you need to briefly and clearly indicate the reference (author, title, edition, page number of the formula).

Students must specify the dimension of values and emphasize the results. And should not calculate a large number of significant figures; calculations must comply with the required accuracy.

All the problems must be solved manually by identified methods as well as using a suitable computer program. For example, Staad pro, ETABS, SAP2000, RISA or others for checking only.
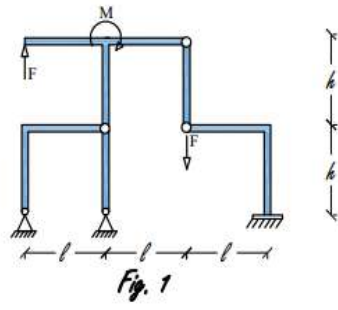
Observing the principle of encoding, the teacher can easily avoid repetition of problems or the similarity of data for homework. that, in turn, depends on the knowledge of students and compels them to carry out their problems independently, especially when the schedule and the calendar for their delivery are strictly observed for the fulfillment of problems
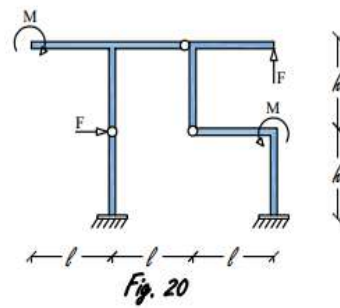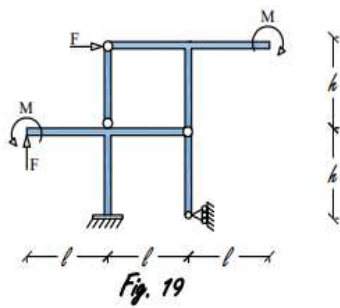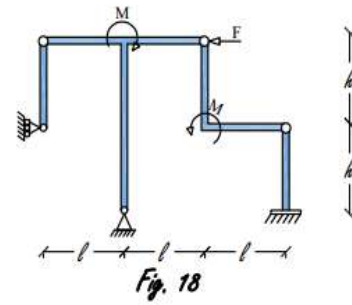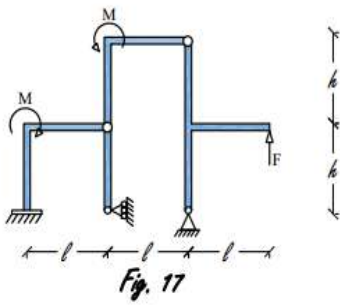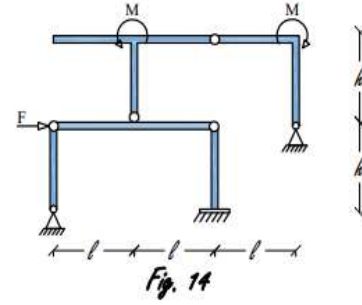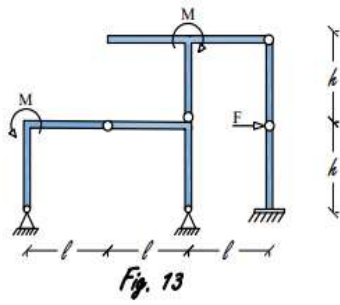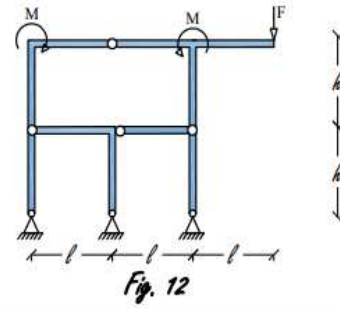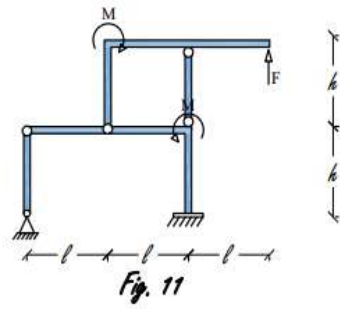
Internal loads (N, V, and M) diagrams of statically determinate frame with internal hinges. Reactions and force in internal hinges.
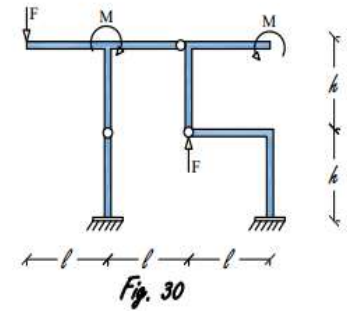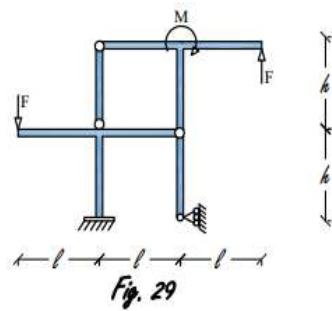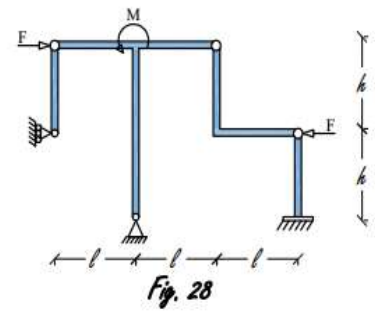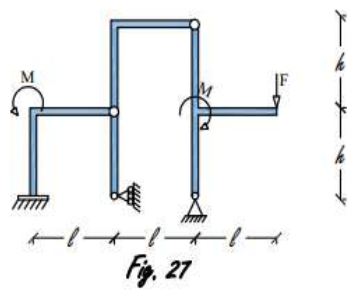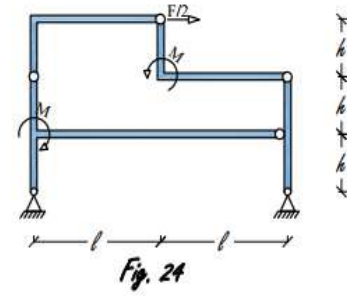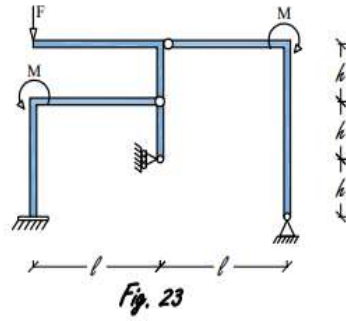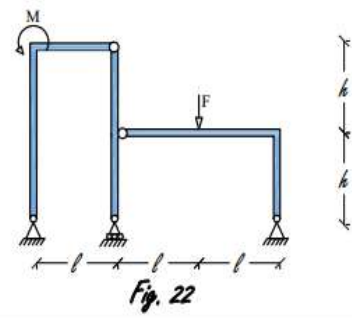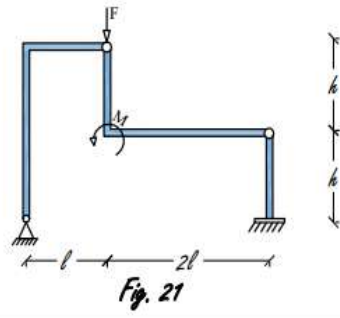
For the frame with internal hinges shown in Figs:
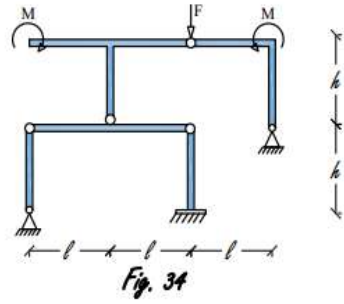- Find reactions at all supports, and force in each internal hinge.
- Draw **M**, **V**, and **N** diagrams.

I-Code	Figure	II-Code	*l* m	*h* m	III-Code	F kN	M kN.m
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05	5	05	6	3	05	21	11
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10	10	10	6	4	10	14	16
11	11	11	4	3	11	26	18
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38	38	38	6	3	38	28	16
39	39	39	4	3	39	37	15
40	40	40	6	4	40	16	10

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

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Fig. 9

Fig. 10

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Fig. 12

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Fig. 31

Fig. 32
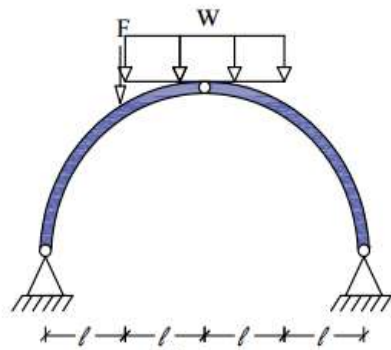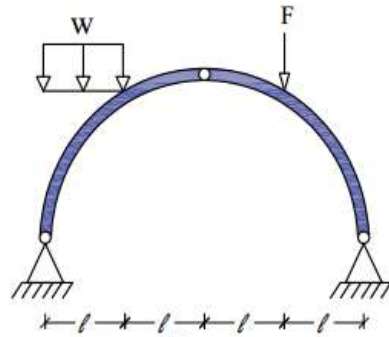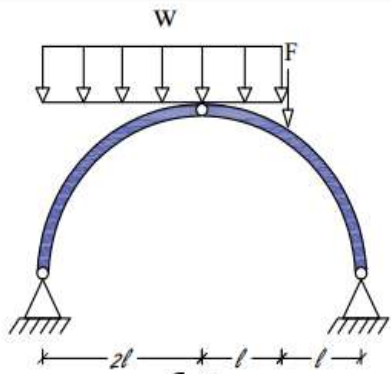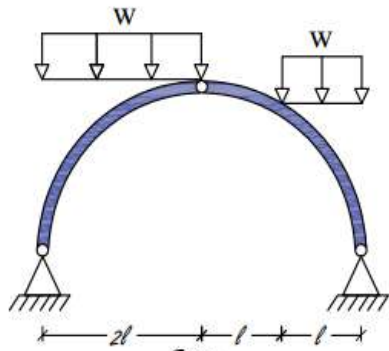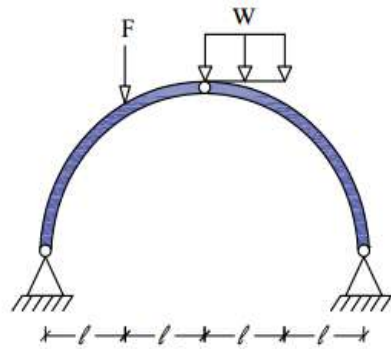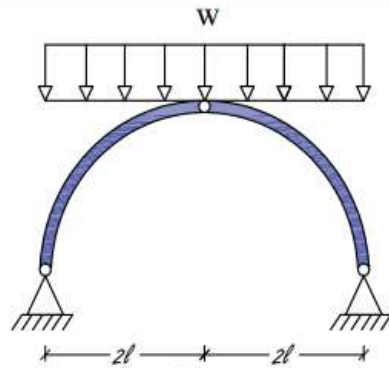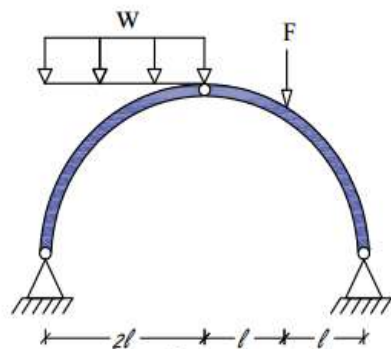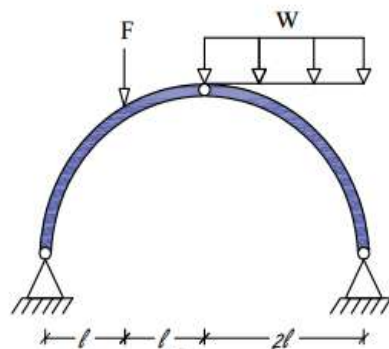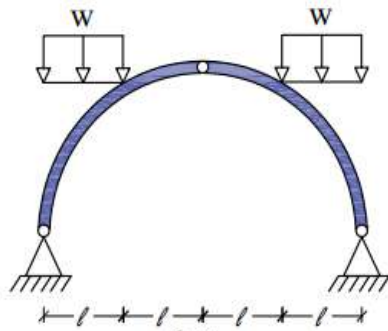

Fig. 33

Fig. 34

Fig. 35

Fig. 36

Fig. 37

Fig. 38

Fig. 39

Fig. 40
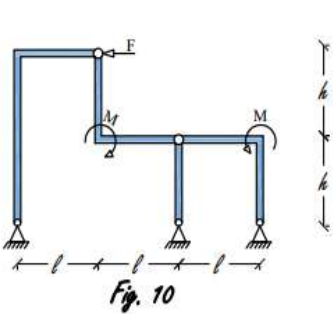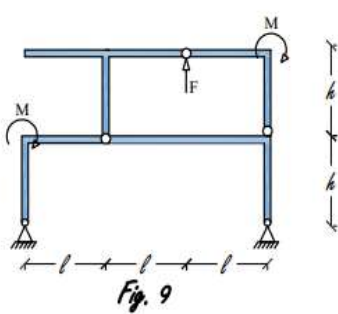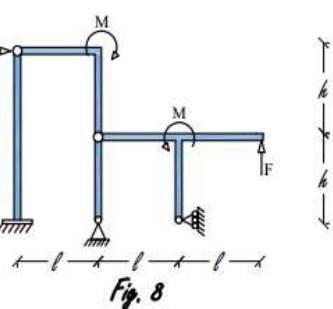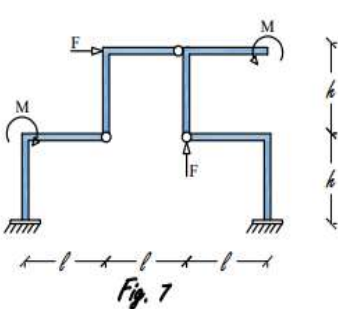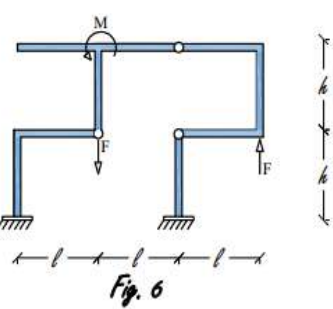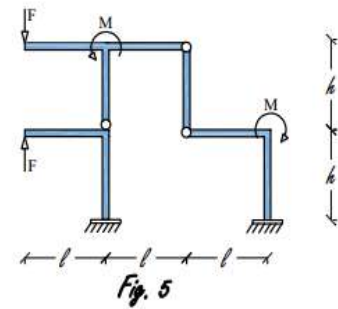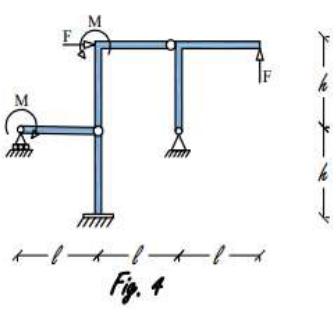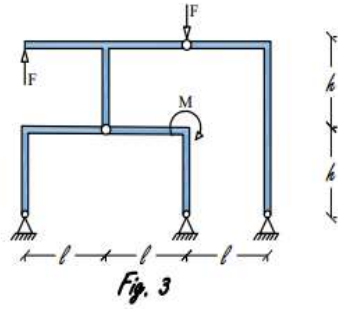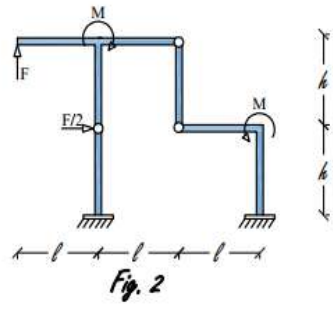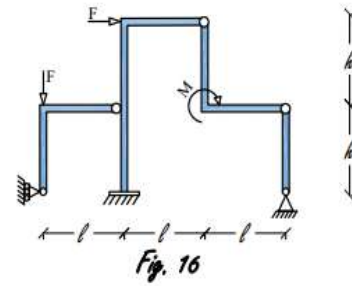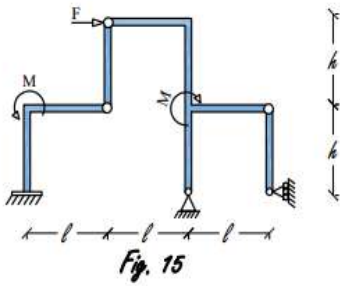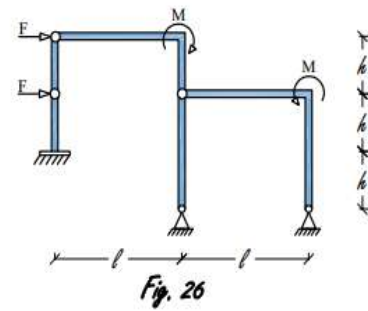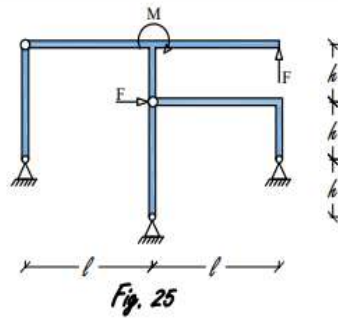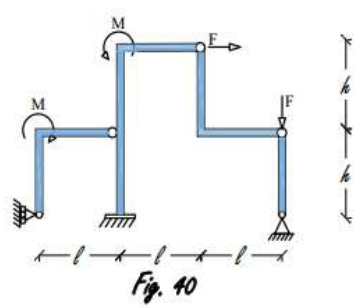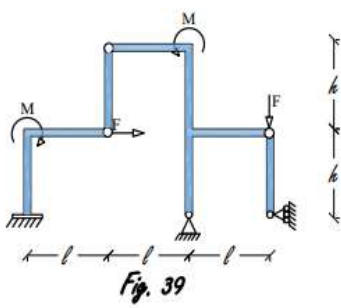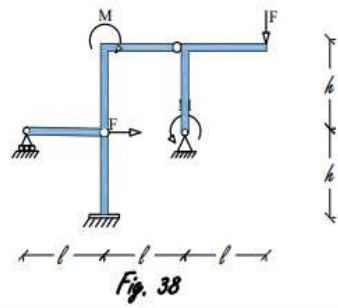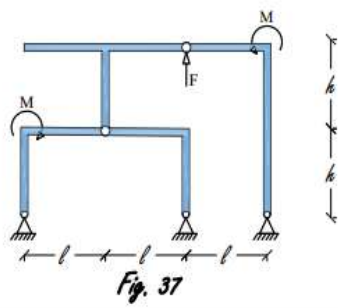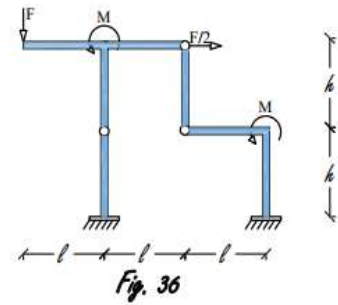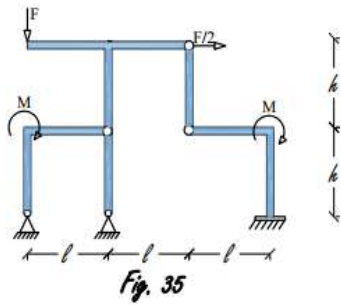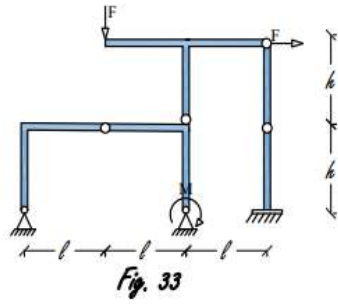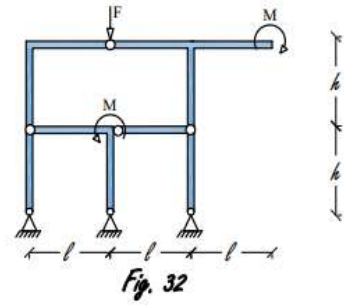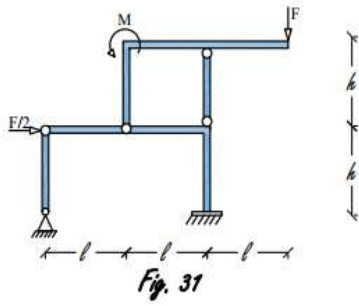
Internal loads (N, V, and M) diagrams for three-hinged circular arch.

- Draw N, V, and M diagrams for the three hinged circular arches shown in Figs.

I-Code	Figure	II-Code	$\frac{l}{m}$	III-Code	$\frac{F}{kN}$	$\frac{w}{kN/m}$
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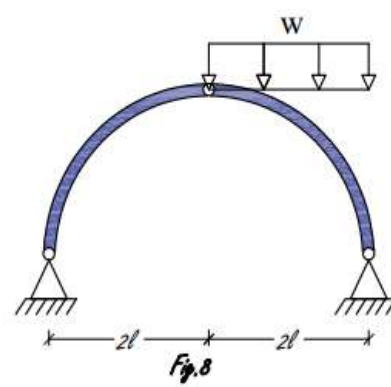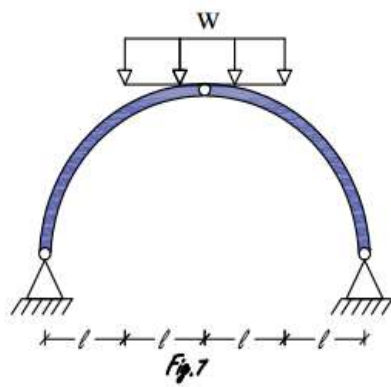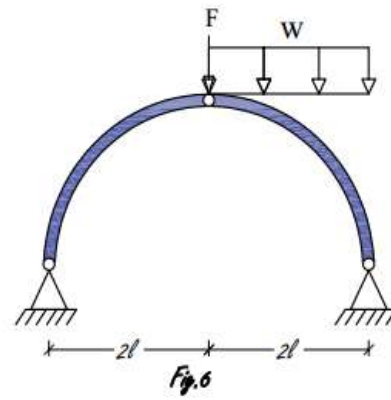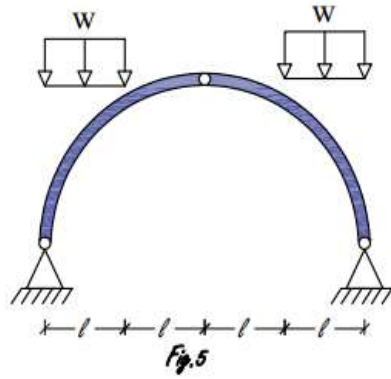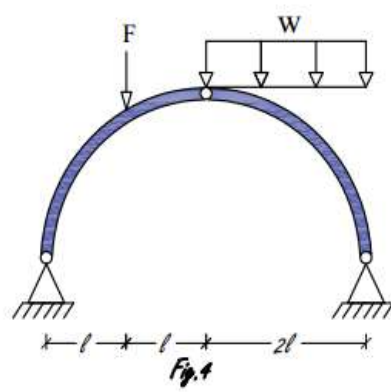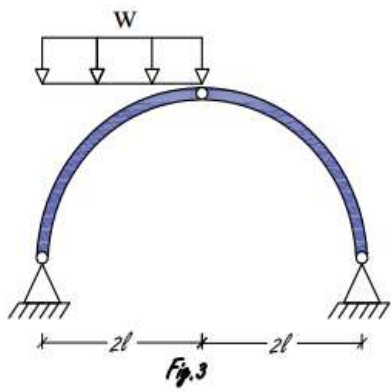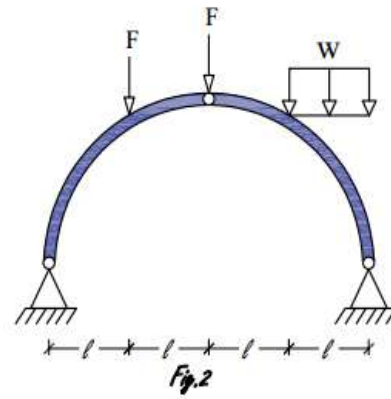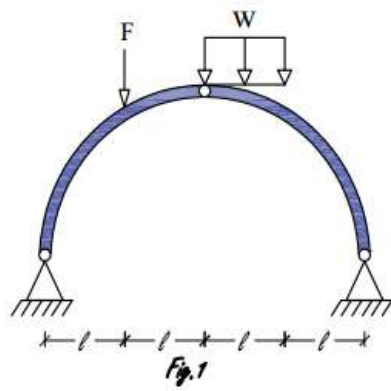
Fig.1

Fig.2

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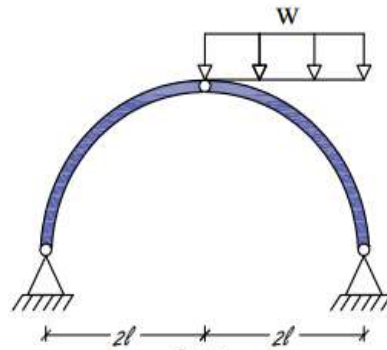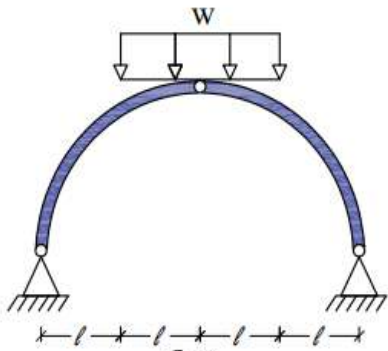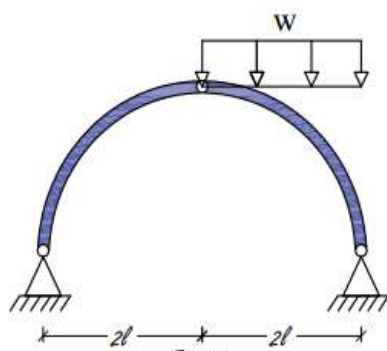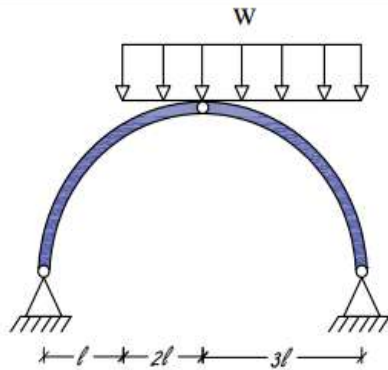Fig.9

Fig.10

Fig.11

Fig.12
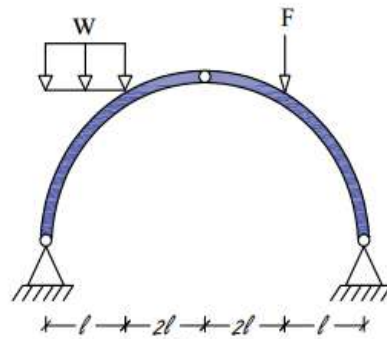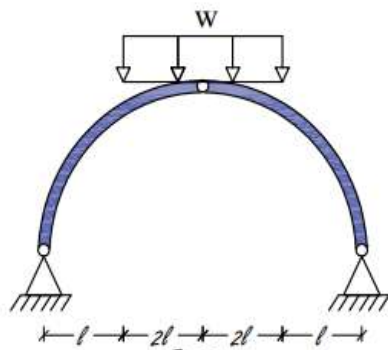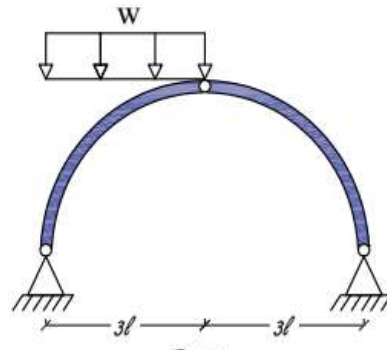

Fig.13

Fig.14

Fig.15
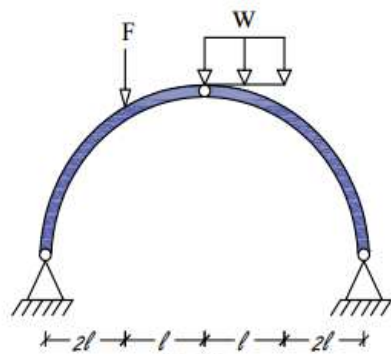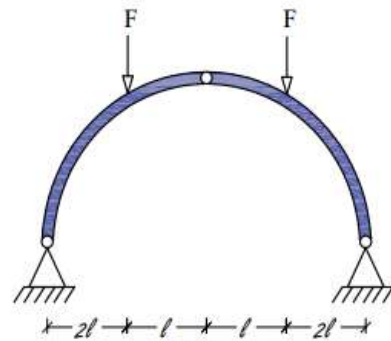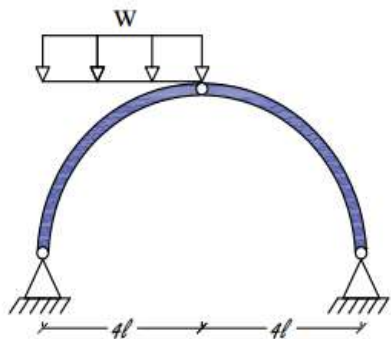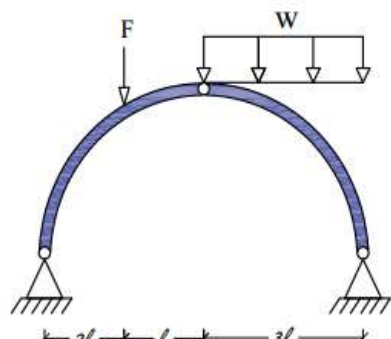

Fig.16

Fig.17

Fig.18

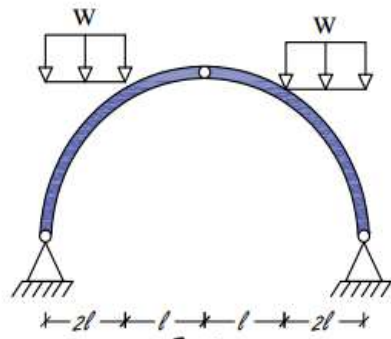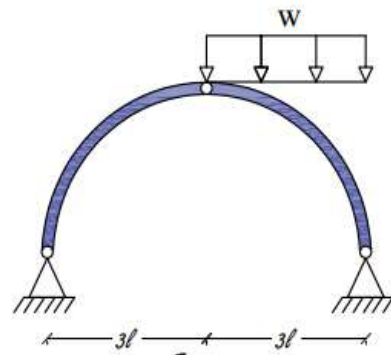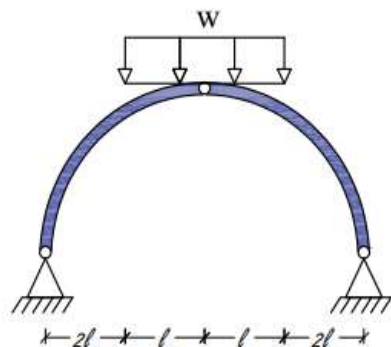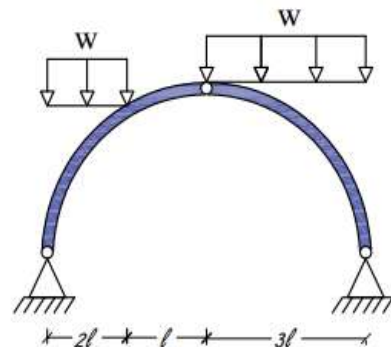Fig.19

Fig.20

Fig.21

Fig.22
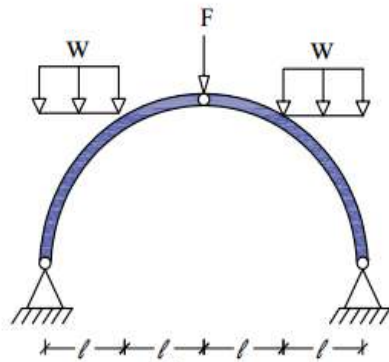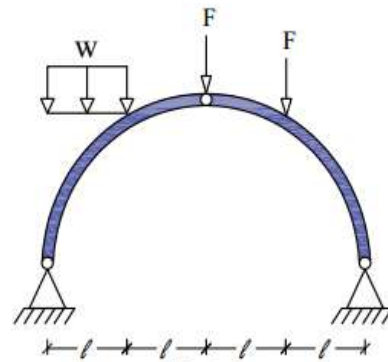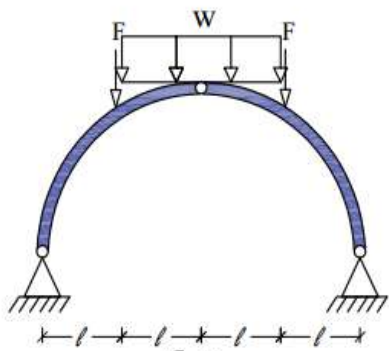

Fig.23

Fig.24

Fig.25

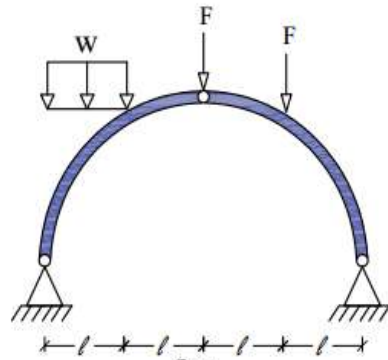Fig.26

Fig.27

Fig.28

Fig.29

Fig.30

Fig.31

Fig.32

Fig.33
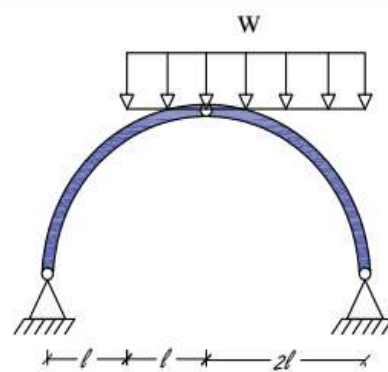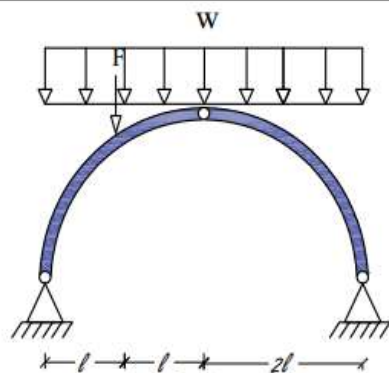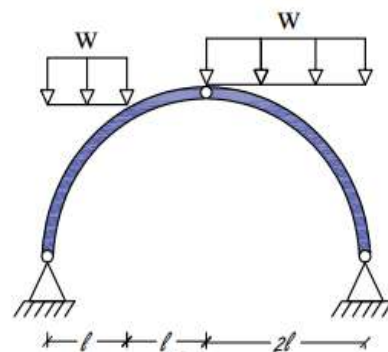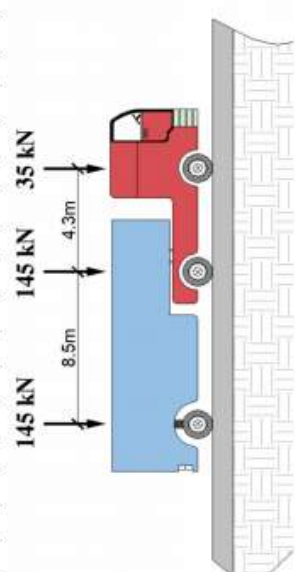

Fig.34

Fig.35

Fig.36
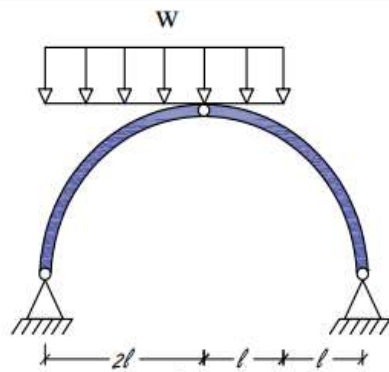
Fig.37

Fig.38

Fig.39

Fig.40

Maximum positive and negative value of the internal loads of the beam due to series of concentrated truck wheel loads.

- Determine maximum negative and positive **momen**t and **shear at the required section** for the multi-span beam shown in Figs due to the series of concentrated load of truck, shown in table.

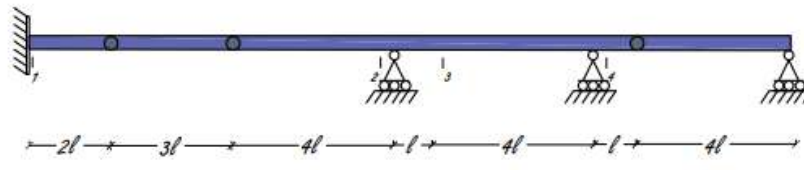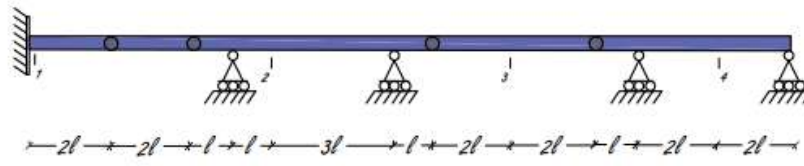| I-Code	Figure	II-Code	l m	Required Section	III-Code	HL-93 Truck
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04	4	04	7	4	04	
05	5	05	6	4	05	
06	6	06	5	3	06	
07	7	07	7	3	07	
08	8	08	5	3	08	
09	9	09	7	4	09	
10	10	10	3	1	10	
11	11	11	4	2	11	
12	12	12	6	4	12	
13	13	13	3	2	13	
14	14	14	5	3	14	
15	15	15	5	3	15	
16	16	16	4	1	16	
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19	19	19	7	2	19	
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31	31	31	3	1	31	
32	32	32	4	2	32	
33	33	33	6	1	33	
34	34	34	7	1	34	
35	35	35	7	4	35	
36	36	36	4	3	36	
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38	38	38	7	2	38	
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40	40	40	3	4	40	

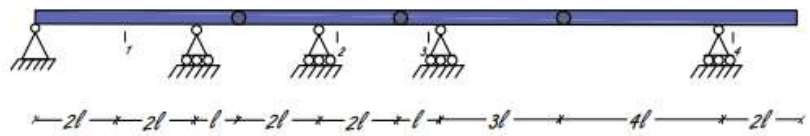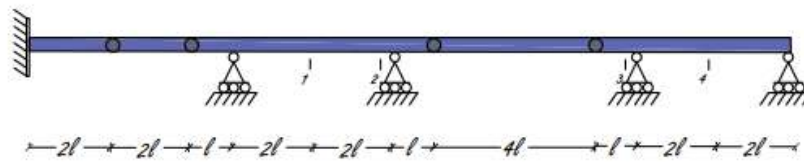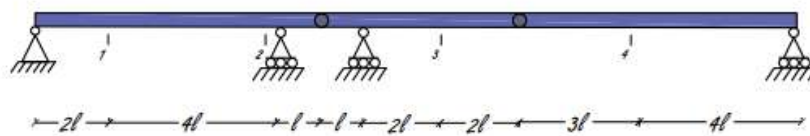The HL-93 Truck: 35 kN, 145 kN, 145 kN with spacings 4.3 m and 8.5 m.
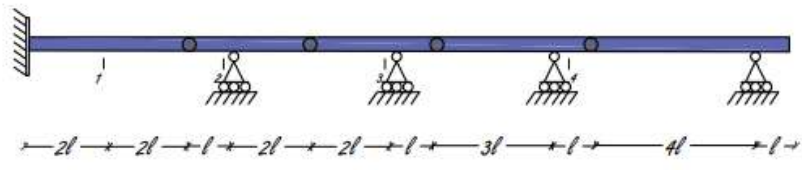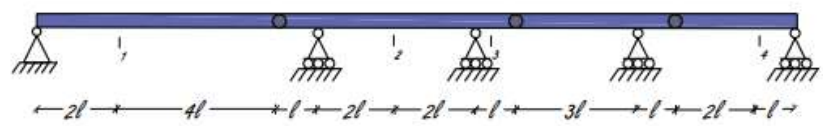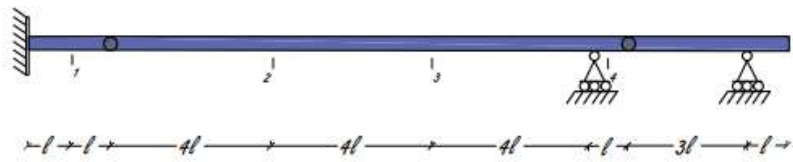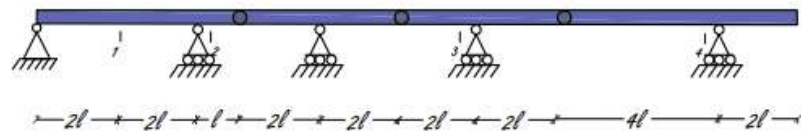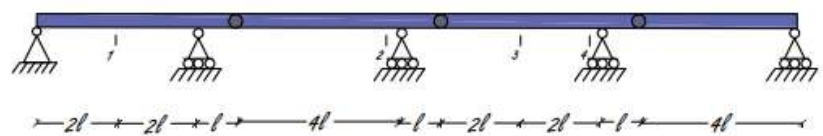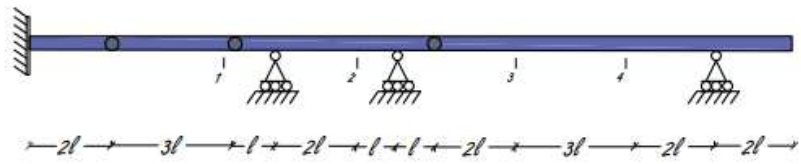
Fig. 1

Fig. 2

Fig. 3

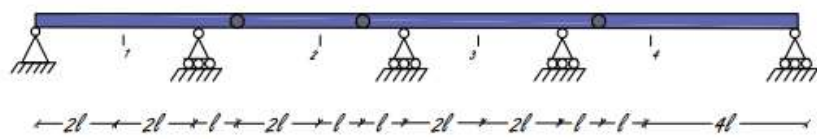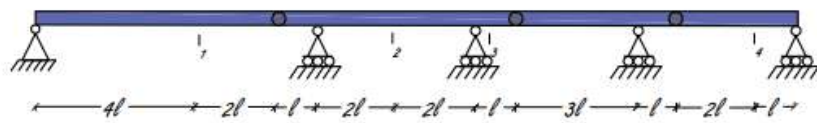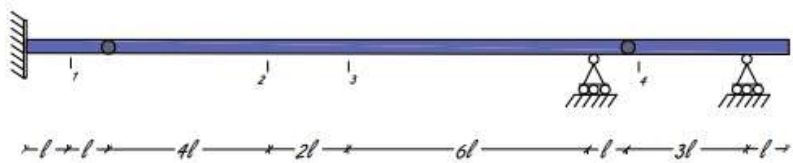Fig. 4

Fig. 5

Fig. 6

Fig. 7
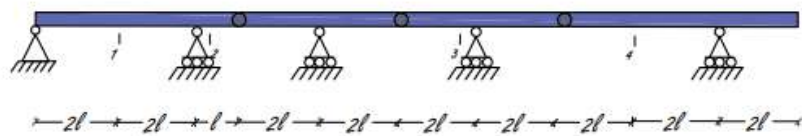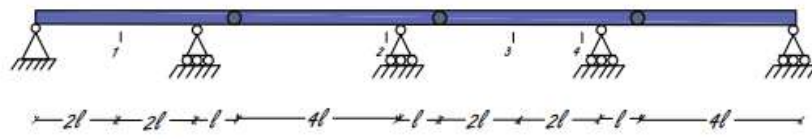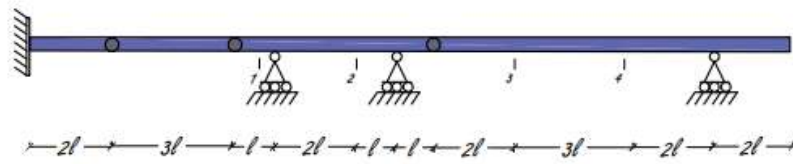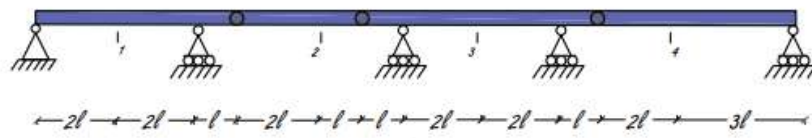

Fig. 8

Fig. 9

Fig. 10
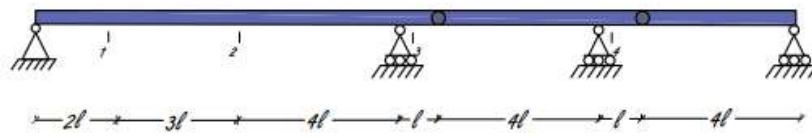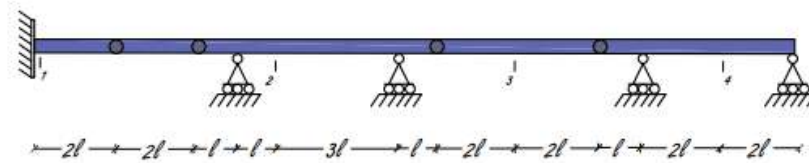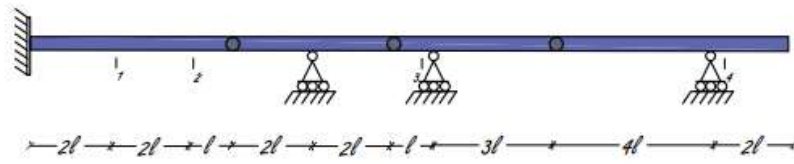
Fig. 11

Fig. 12

Fig. 13
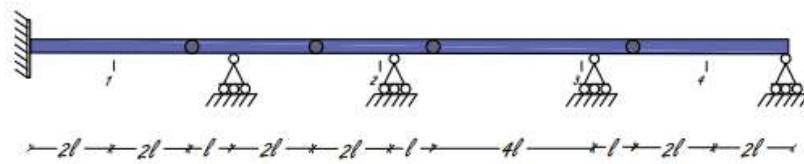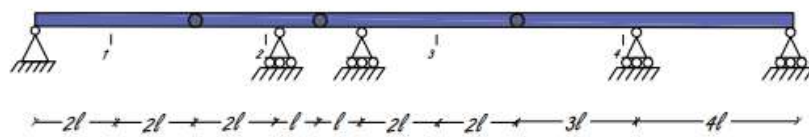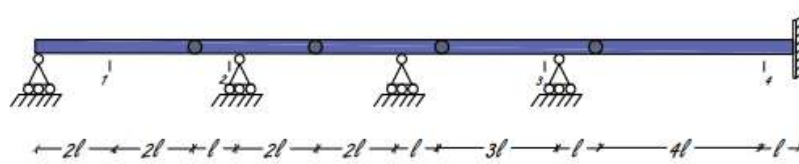

Fig. 14

Fig. 15

Fig. 16
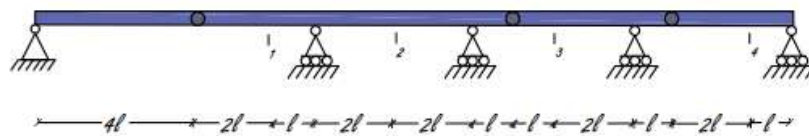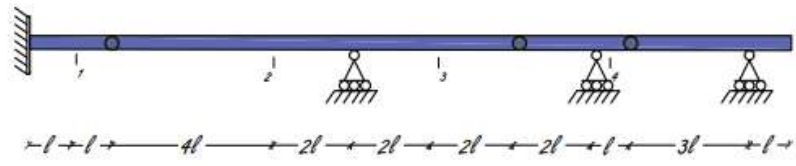

Fig. 17

Fig. 18

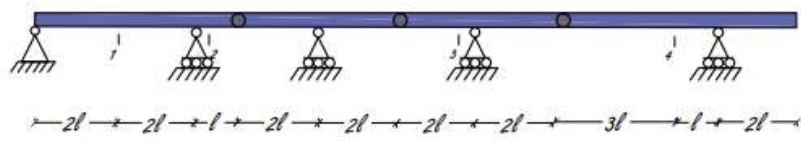
Fig. 19

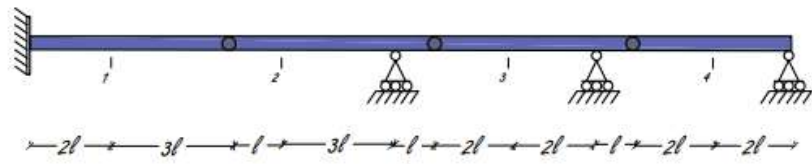Fig. 20

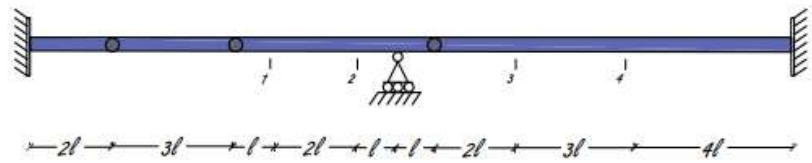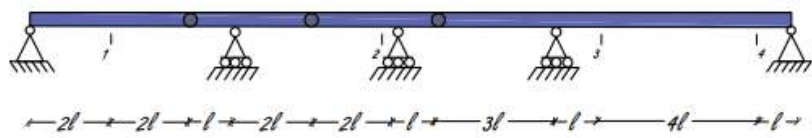Fig. 21

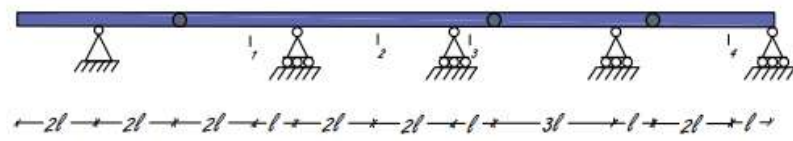Fig. 22
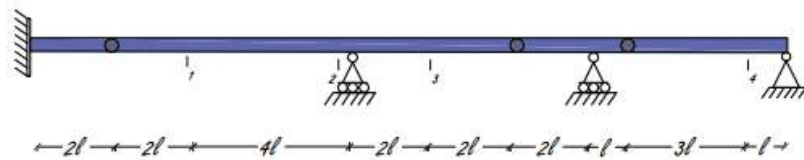

Fig. 23

Fig. 24
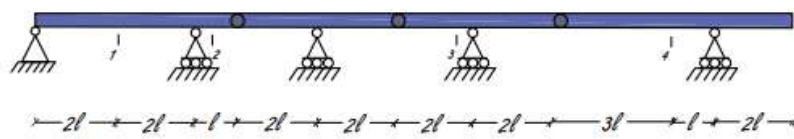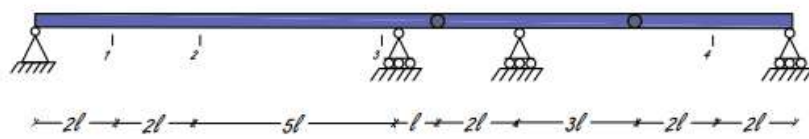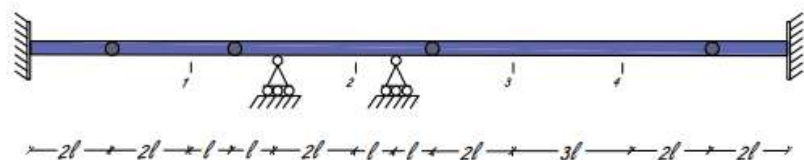

Fig. 25

Fig. 26

Fig. 27
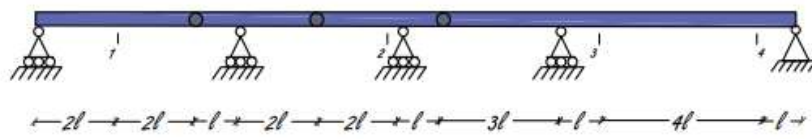

Fig. 28

Fig. 29

Fig. 30

Fig. 31

Fig. 32

Fig. 33

Fig. 34

Fig. 35

Fig. 36

Fig. 37

Fig. 38

Fig. 39

Fig. 40

Force method of analysis- statically indeterminate truss.
- Find the reactions at all supports of the truss shown in Figs. **Use force method**.
- ❖ EA is constant.

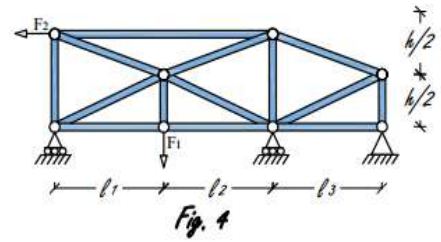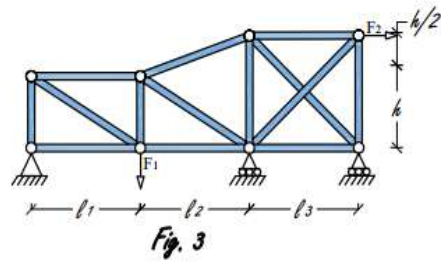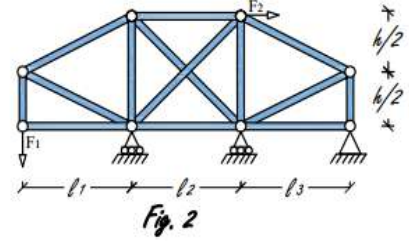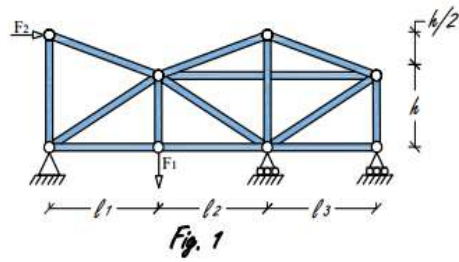| I-Code	Figure	II-Code	l_1 m	l_2 m	l_3 m	h m	III-Code	F_1 kN	F_2 kN
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05	5	05	5	2	3	3	05	35	140
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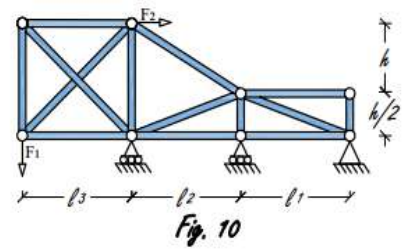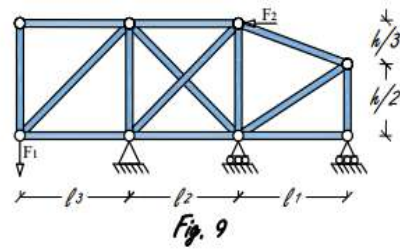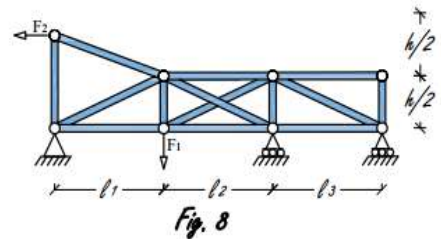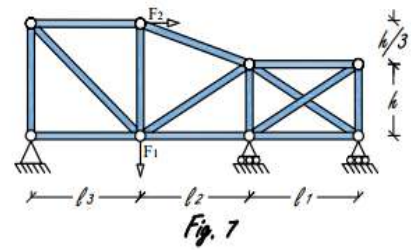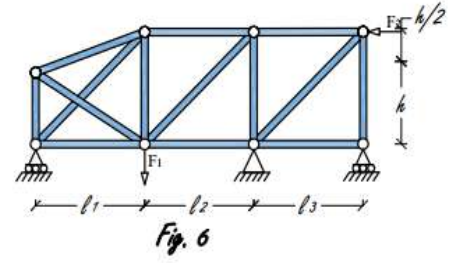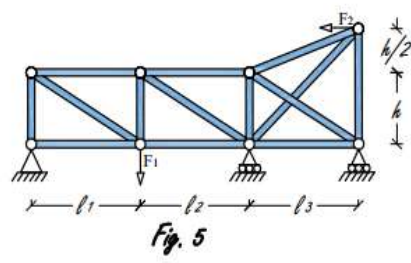
Fig. 1

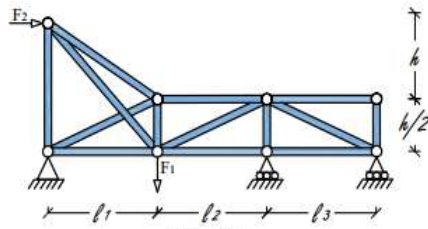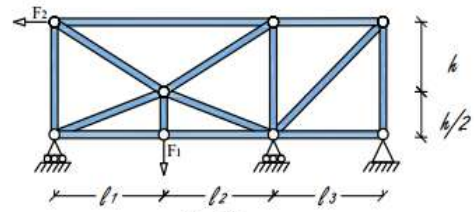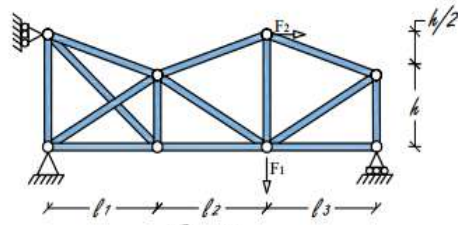Fig. 2

Fig. 3

Fig. 4

Fig. 5
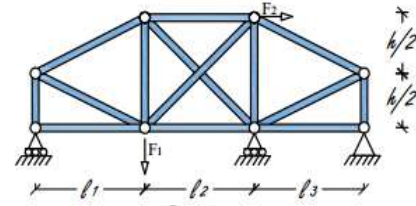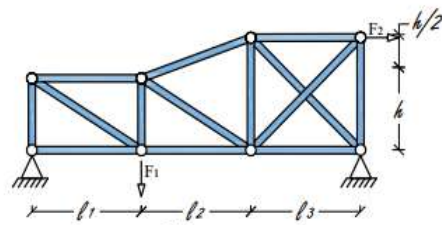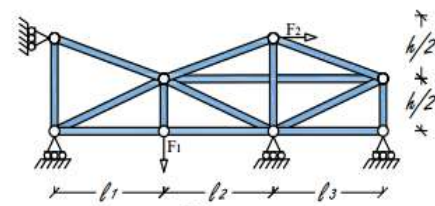
Fig. 6

Fig. 7

Fig. 8

Fig. 9
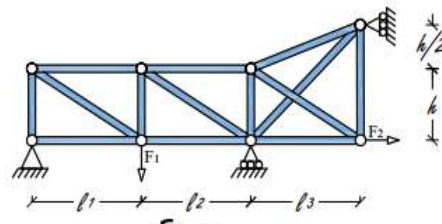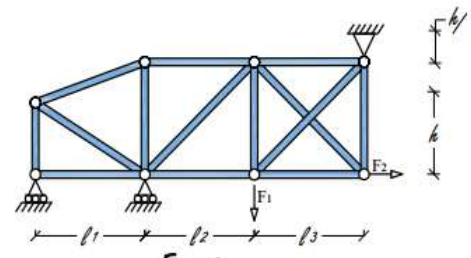
Fig. 10

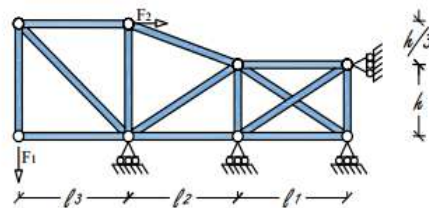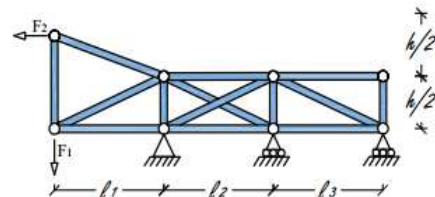22

Fig. 11

Fig. 12

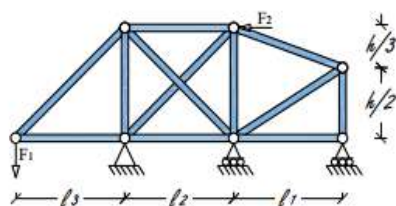Fig. 13

Fig. 14
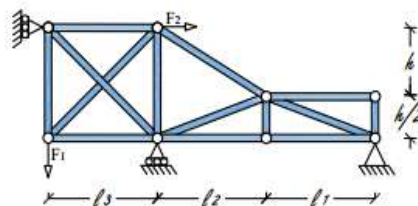

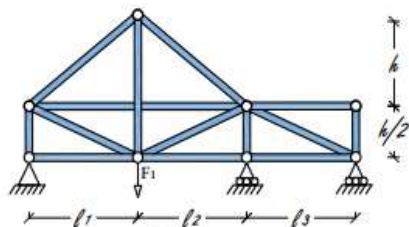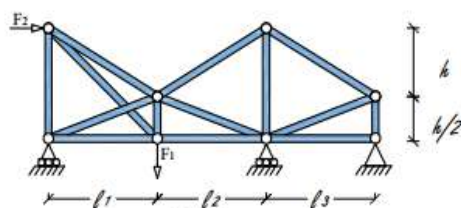Fig. 15

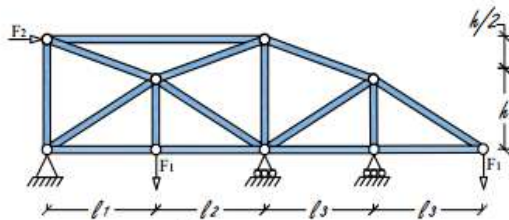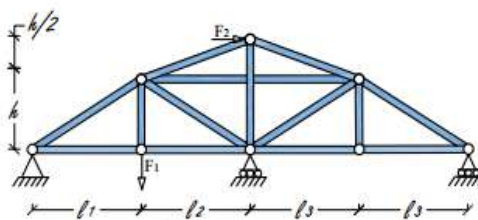Fig. 16

Fig. 17

Fig. 18

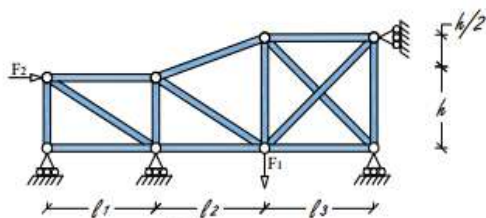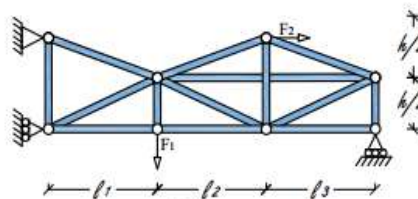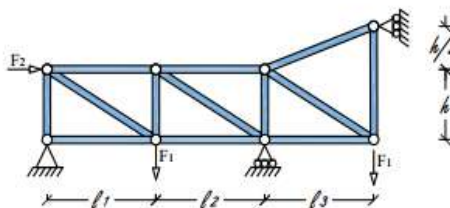Fig. 19

Fig. 20

23

Fig. 21

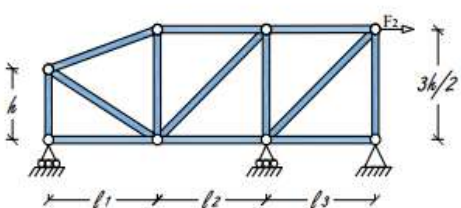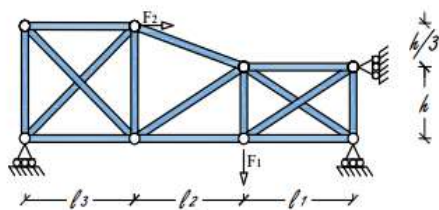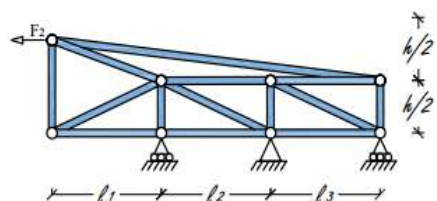
Fig. 22

Fig. 23

Fig. 24

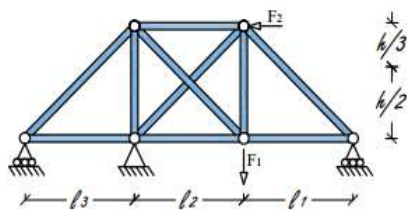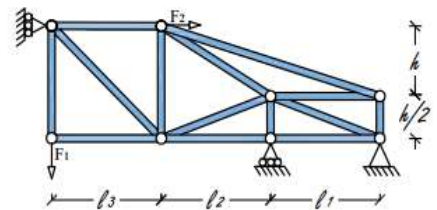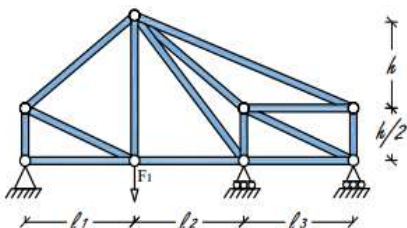
Fig. 25

Fig. 26

Fig. 27

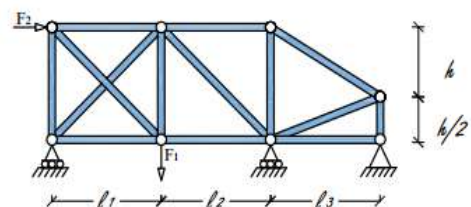
Fig. 28

Fig. 29

Fig. 30

Fig. 31

Fig. 32

Fig. 33

Fig. 34

Fig. 35

Fig. 36
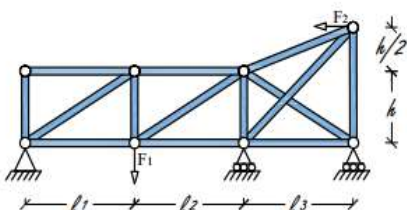
Fig. 37
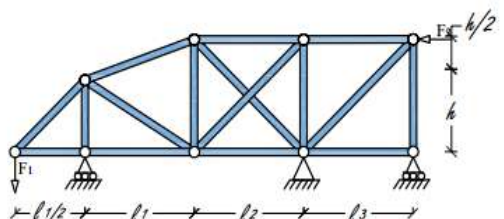
Fig. 38
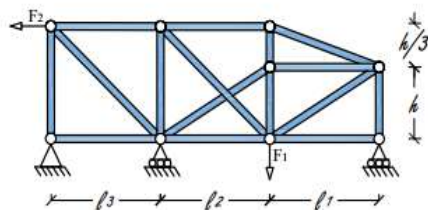
Fig. 39
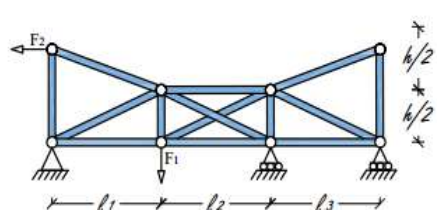
Fig. 40

Moment distribution method of analysis – sway frame
- Draw M diagram for the frame shown in Figs **by using:**
- ➢ Moment distribution method.
- ❖ EI is constant.

I-Code	Figure	II-Code	l_1 m	l_2 m	h m	III-Code	F kN	w kN/m
01	1	01	7	7	2	01	13	12
02	2	02	3	7	2	02	11	6
03	3	03	3	6	5	03	20	11
04	4	04	4	3	3	04	16	8
05	5	05	6	5	5	05	13	10
06	6	06	4	4	2	06	11	6
07	7	07	7	6	4	07	14	6
08	8	08	5	8	3	08	19	8
09	9	09	7	6	4	09	11	8
10	10	10	7	4	2	10	20	5
11	11	11	6	6	5	11	15	9
12	12	12	5	5	2	12	9	11
13	13	13	4	3	3	13	14	6
14	14	14	4	5	4	14	12	10
15	15	15	6	7	3	15	19	10
16	16	16	3	5	5	16	17	6
17	17	17	7	8	4	17	19	10
18	18	18	5	8	2	18	13	8
19	19	19	6	5	2	19	10	5
20	20	20	6	6	5	20	8	9
21	21	21	7	7	3	21	12	9
22	22	22	4	3	3	22	14	12
23	23	23	5	6	2	23	15	6
24	24	24	6	7	2	24	12	11
25	25	25	6	6	5	25	13	8
26	26	26	4	6	5	26	20	8
27	27	27	3	3	5	27	16	6
28	28	28	5	6	3	28	11	11
29	29	29	7	3	3	29	12	10
30	30	30	5	3	5	30	8	9
31	31	31	3	5	5	31	9	12
32	32	32	4	6	2	32	9	9
33	33	10	3	7	5	10	9	8
34	34	11	6	5	5	11	20	9
35	35	12	3	8	5	12	19	8
36	36	13	7	4	2	13	9	9
37	37	14	6	8	4	14	17	11
38	38	15	5	6	3	15	20	7
39	39	39	4	6	3	39	20	6
40	40	40	7	4	3	40	20	9

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

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Fig. 11

Fig. 12

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