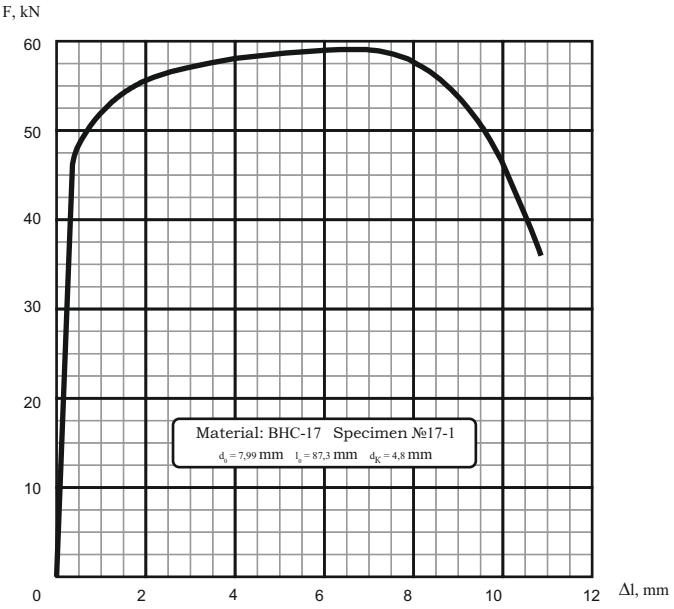
USATU

кафедра СОПРОТИВЛЕНИЯ МАТЕРИАЛОВ

Computational and graphical work of strength of material

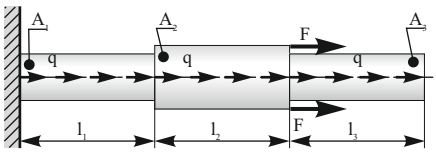
Group	Name and surname	Variant
		1
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



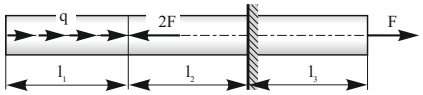
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

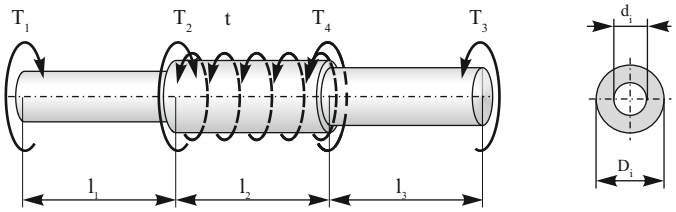
F, kN	l_1, m	l_2, m	l_3, m
33	0,2	0,4	1,0

q, kN/m	A_1/A	A_2/A	A_3/A
14	2,5	1,5	2,7

Additional data for task 3:

Material
20X
A_4, cm^2
7,7

4. Checking calculation of strength of staged rod under torsion.

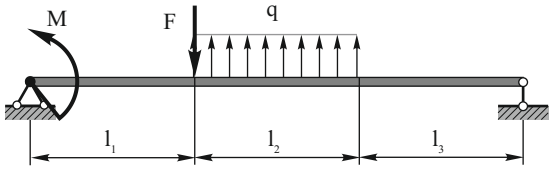


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t, kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,3	0,8	0,5	22	36	31	15

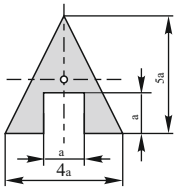
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,6	0,4	3,0	0,4	2,1	0,4	АМцМ

5. Designing calculation of strength under bending.



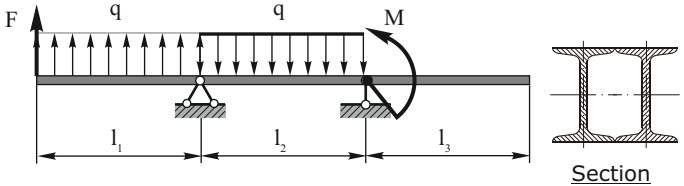
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,2	20	5	5	СЧ12-28

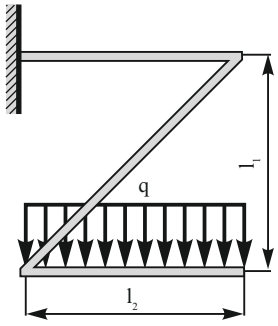
6. Cheking calculation of beam made of rolled sections.



Section
№ 12

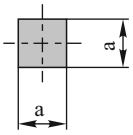
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,7	0,6	0,5	43	41	24	Ст5

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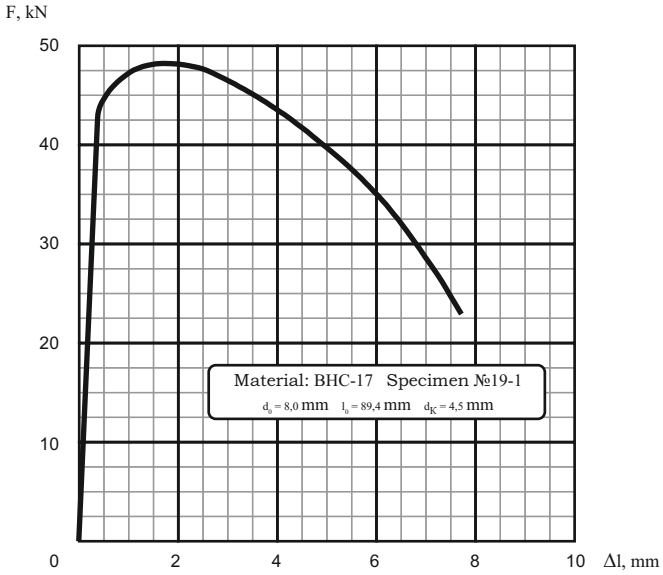
Computational and graphical work of strength of material

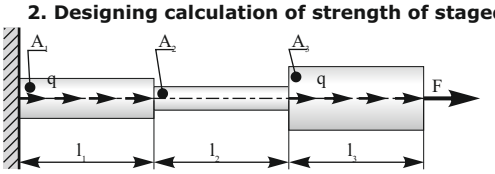
Group	Name and surname	Variant
		2
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



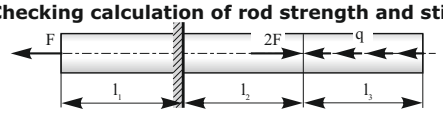
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4,
it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

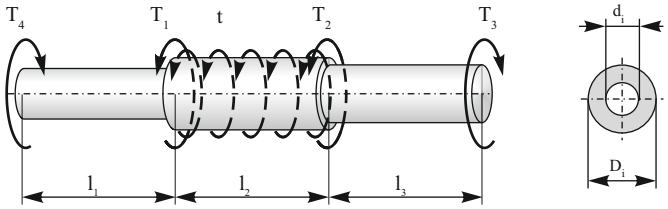
F, kN	l_1, m	l_2, m	l_3, m
16	0,9	0,7	0,9

q, kN/m	A_1/A	A_2/A	A_3/A
17	2,4	3,0	2,4

Additional data for task 3:

Material
40X
A_4,cm^2
9,3

4. Checking calculation of strength of staged rod under torsion.

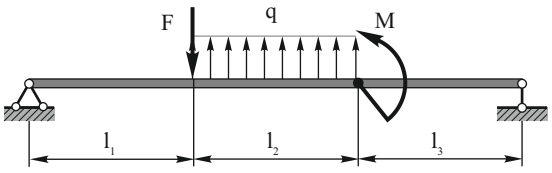


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,8	0,8	0,3	14	43	48	28

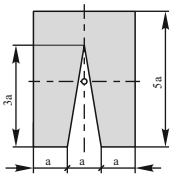
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,4	0,3	1,9	0,3	2,4	0,3	AMr2M

5. Designing calculation of strength under bending.



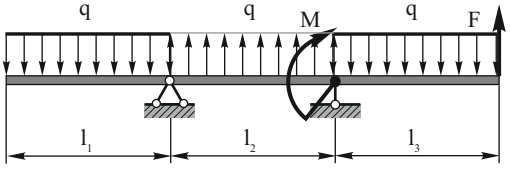
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

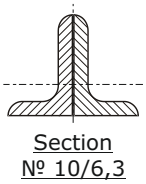
cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,3	0,1	0,2	25	15	21	СЧ15-32

6. Cheking calculation of beam made of rolled sections.

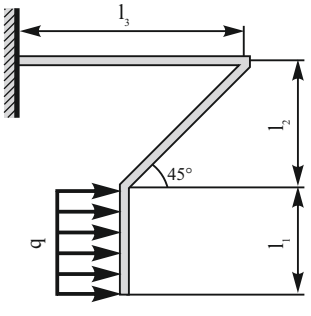




Section
№ 10/6,3

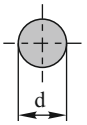
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution,
hazardous section stress distribution indicating the most loaded points.
Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,5	0,8	0,4	24	30	41	Ст4

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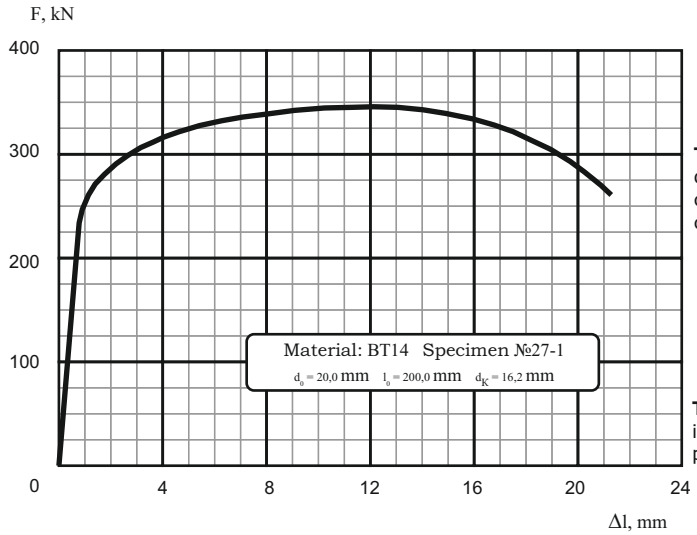
Computational and graphical work of strength of material

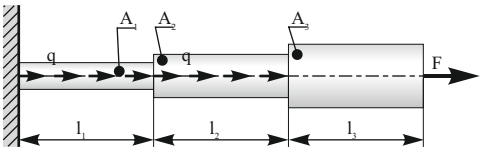
Group	Name and surname	Variant
		3
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



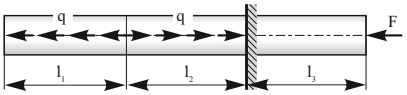
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

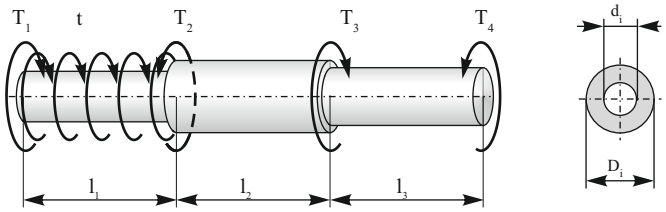
F, kN	l_1, m	l_2, m	l_3, m
20	0,2	1,0	0,4

q, kN/m	A_1/A	A_2/A	A_3/A
11	2,6	1,6	1,9

Additional data for task 3:

Material
45X
A_4, cm^2
8,4

4. Checking calculation of strength of staged rod under torsion.

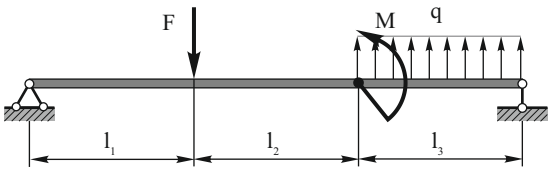


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,6	0,6	0,2	28	21	15	27

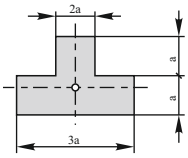
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,5	0,7	2,0	0,7	2,3	0,7	АМг2П

5. Designing calculation of strength under bending.



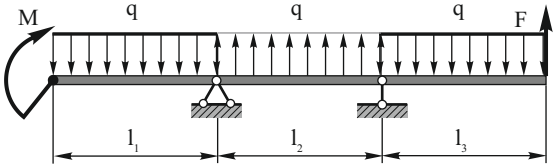
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

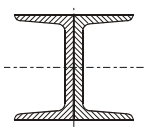
cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,1	0,2	0,3	25	10	10	СЧ18-38

6. Cheking calculation of beam made of rolled sections.

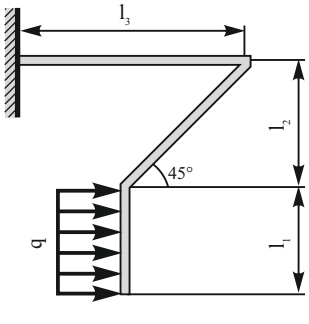




section № 10

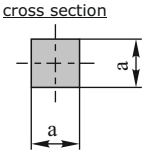
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,3	0,2	0,5	40	38	39	Ст3

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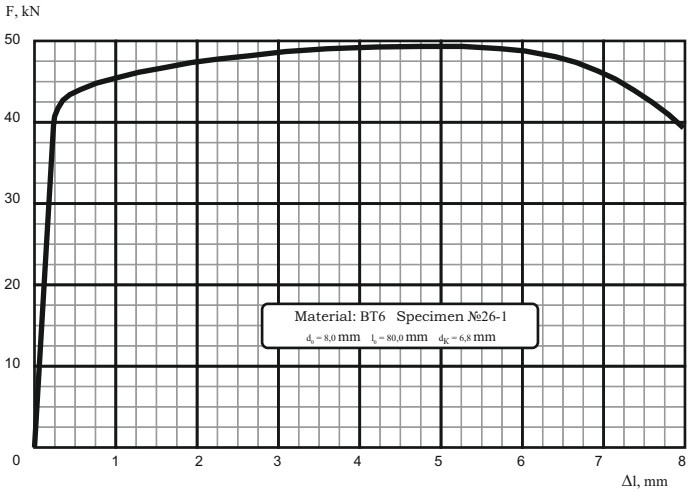
Computational and graphical work of strength of material

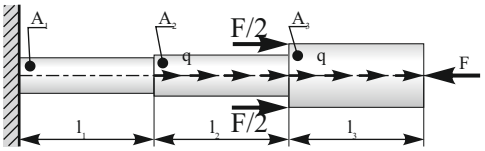
Group	Name and surname	Variant
		4
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



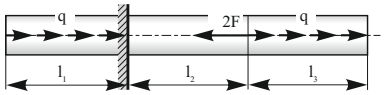
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

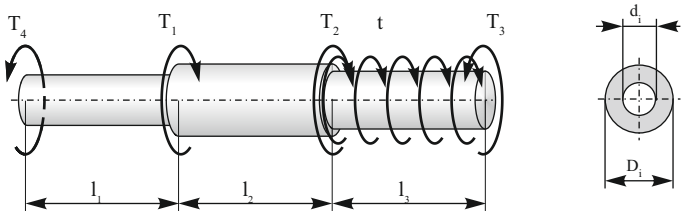
F, kN	l_1, m	l_2, m	l_3, m
24	0,4	0,4	0,5

q, kN/m	A_1/A	A_2/A	A_3/A
13	1,4	1,5	1,1

Additional data for task 3:

Material
30XM
A_4, cm^2
6,3

4. Checking calculation of strength of staged rod under torsion.

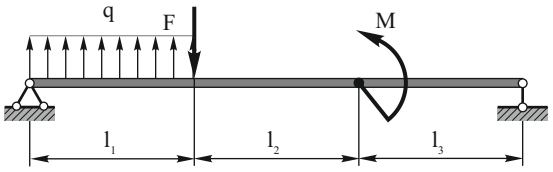


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,2	0,8	0,7	16	32	47	13

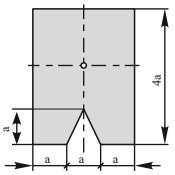
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,9	0,7	2,0	0,7	1,7	0,7	АМг6

5. Designing calculation of strength under bending.



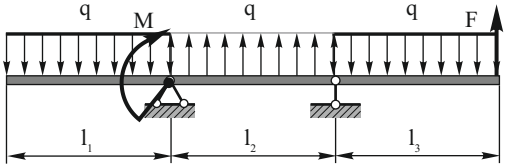
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

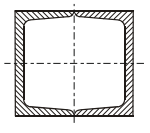
cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,1	0,1	10	15	5	СЧ21-40

6. Cheking calculation of beam made of rolled sections.

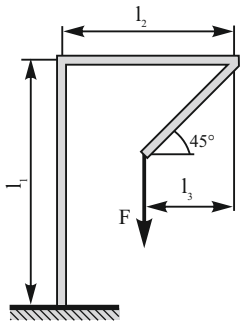




section № 14

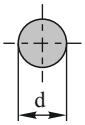
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,5	0,6	0,8	30	8	48	Ст2

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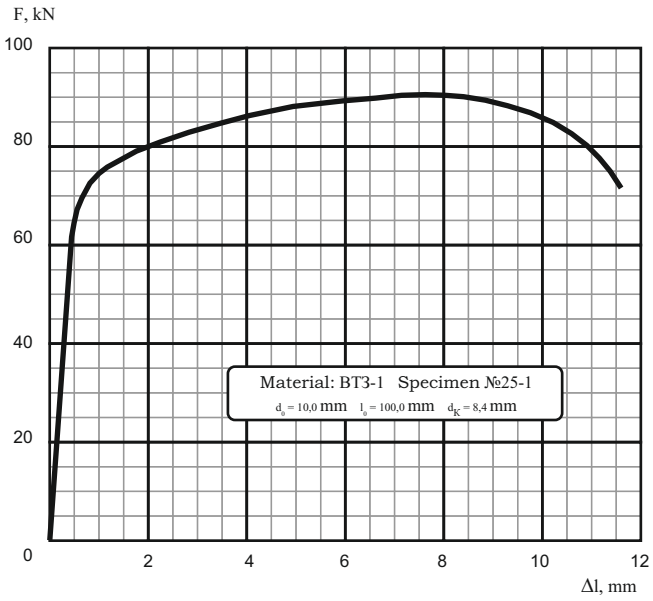
Computational and graphical work of strength of material

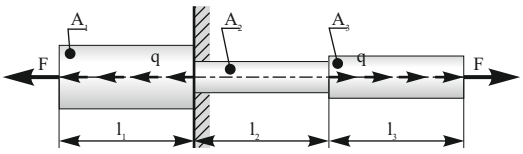
Group	Name and surname	Variant
		5
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



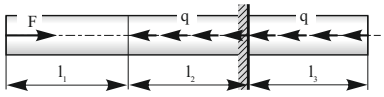
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

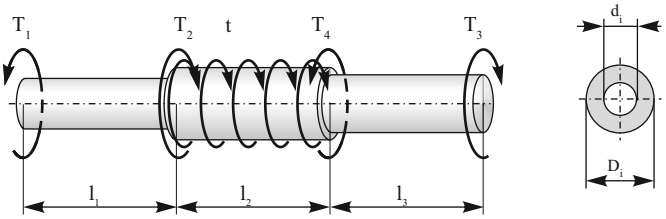
F, kN	l_1, m	l_2, m	l_3, m
15	0,7	1,0	0,7

q, kN/m	A_1/A	A_2/A	A_3/A
16	2,4	2,3	1,5

Additional data for task 3:

Material
40XH
A_4, cm^2
5,2

4. Checking calculation of strength of staged rod under torsion.

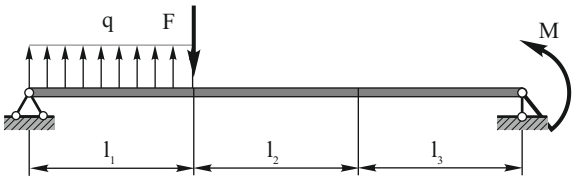


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

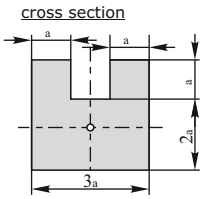
l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,8	0,8	0,3	11	41	5	44

D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
3,0	0,7	1,3	0,7	2,3	0,7	AMr6M

5. Designing calculation of strength under bending.

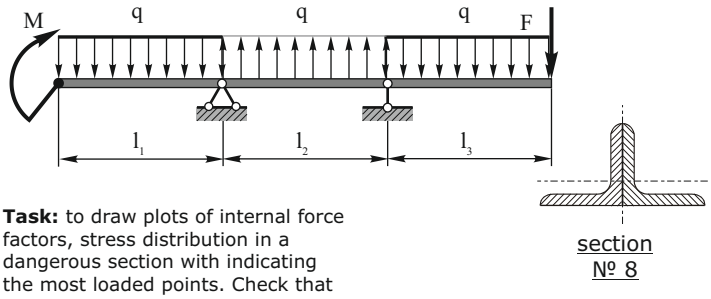


Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.



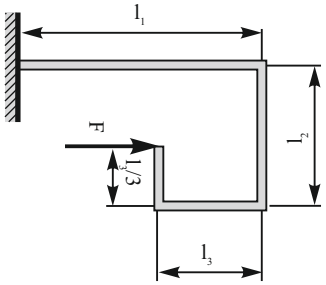
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,1	0,3	0,4	10	50	5	СЧ24-44

6. Cheking calculation of beam made of rolled sections.

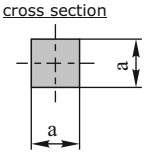


Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,6	0,6	0,7	25	35	10	Ст1

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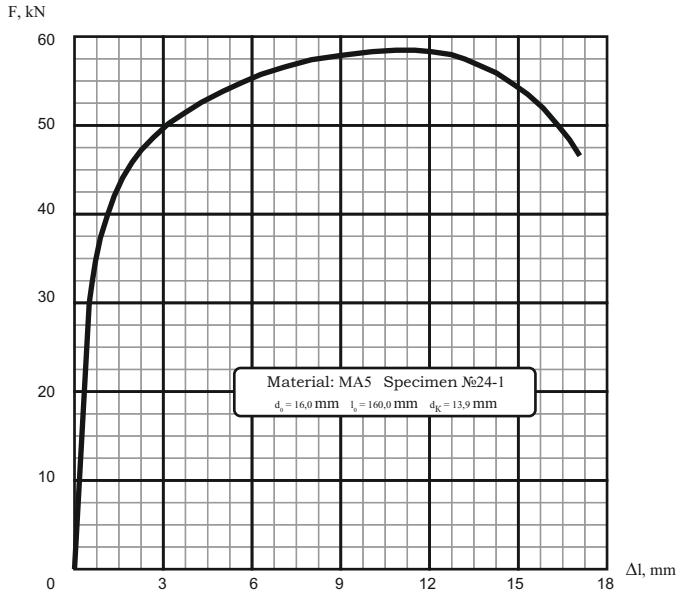
Computational and graphical work of strength of material

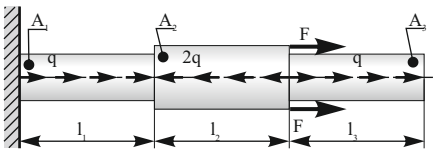
Group	Name and surname	Variant
		6
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



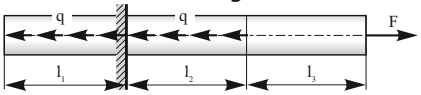
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

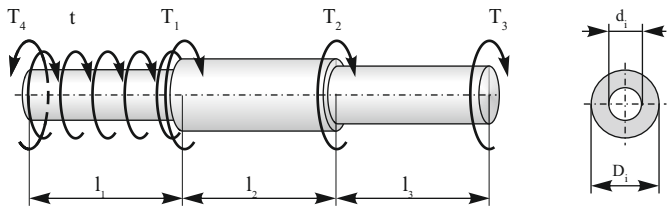
F, kN	l_1, m	l_2, m	l_3, m
31	0,4	0,3	0,2

q, kN/m	A_1/A	A_2/A	A_3/A
11	2,0	2,6	1,5

Additional data for task 3:

Material
12XH3A
A_4, cm^2
6,9

4. Checking calculation of strength of staged rod under torsion.

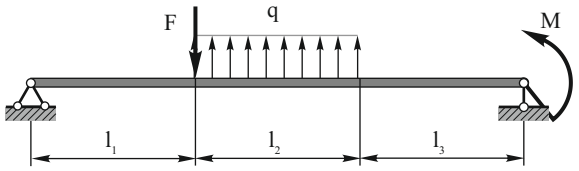


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,5	0,8	0,5	16	42	29	32

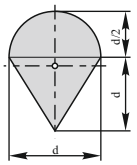
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,1	0,3	2,7	0,3	3,0	0,3	Д1 (О)

5. Designing calculation of strength under bending.



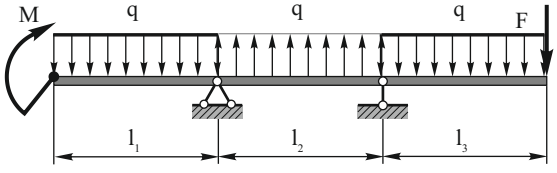
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

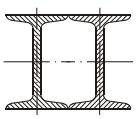
cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,1	0,1	0,4	10	60	20	СЧ28-48

6. Cheking calculation of beam made of rolled sections.

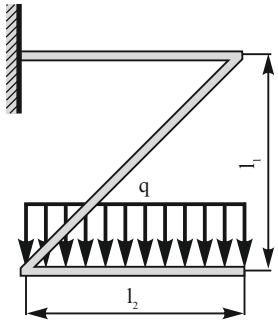




section № 10

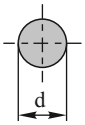
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,2	0,6	0,3	20	36	8	60

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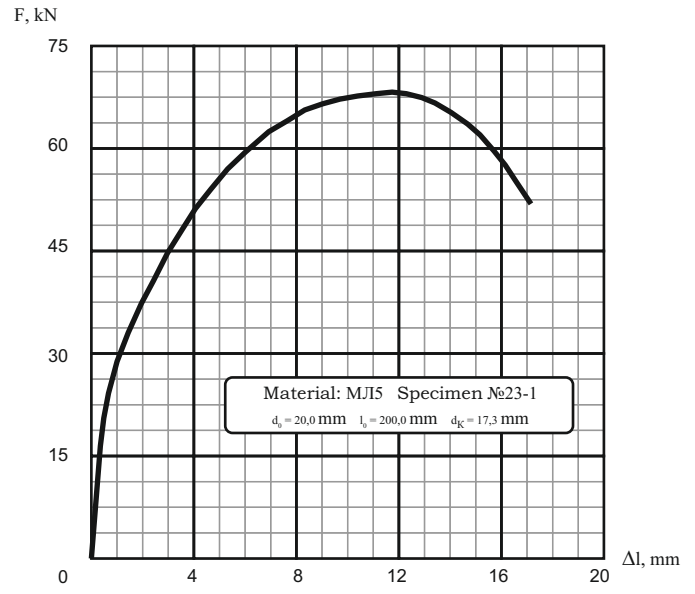
Computational and graphical work of strength of material

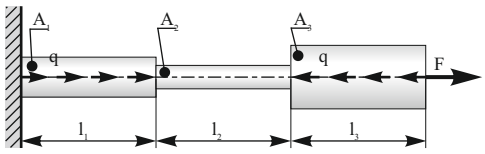
Group	Name and surname	Variant
		7
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



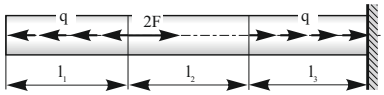
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

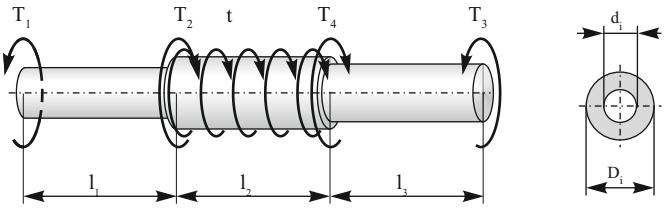
F, kN	l_1, m	l_2, m	l_3, m
20	0,2	0,1	0,1

q, kN/m	A_1/A	A_2/A	A_3/A
20	2,8	1,2	2,4

Additional data for task 3:

Material
20XH3A
A_4, cm^2
8,9

4. Checking calculation of strength of staged rod under torsion.

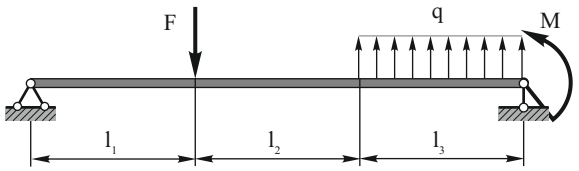


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

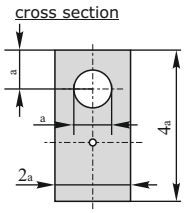
l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,7	0,4	0,4	16	46	49	34

D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,5	0,7	1,5	0,7	1,7	0,7	Д1П (3 и ЕС)

5. Designing calculation of strength under bending.

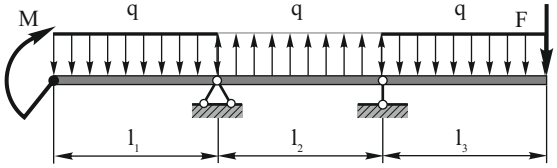


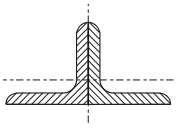
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,5	0,1	0,1	30	30	10	СЧ32-52

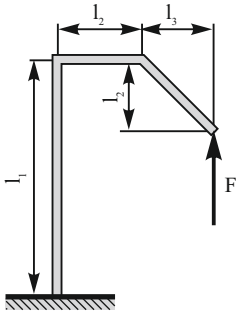
6. Cheking calculation of beam made of rolled sections.



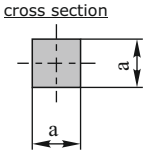


Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.



Input data for tasks 6 and 7:

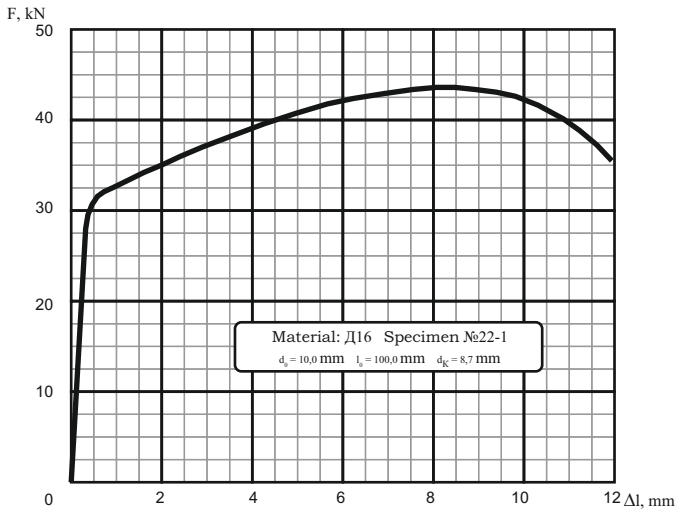
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,3	0,7	0,5	13	5	23	50

USATU кафедра СОПРОТИВЛЕНИЯ МАТЕРИАЛОВ

Computational and graphical work of strength of material

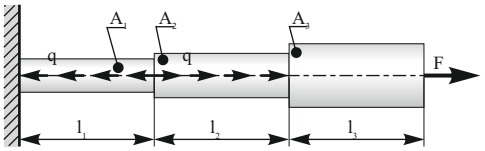
Group	Name and surname	Variant
		8
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



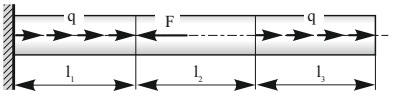
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

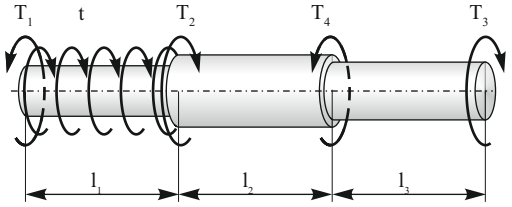
F, kN	l_1, m	l_2, m	l_3, m
26	0,3	0,1	0,8

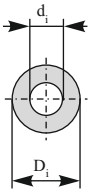
q, kN/m	A_1/A	A_2/A	A_3/A
18	1,0	2,0	3,0

Additional data for task 3:

Material
40XHMA
A_4, cm^2
8,9

4. Checking calculation of strength of staged rod under torsion.



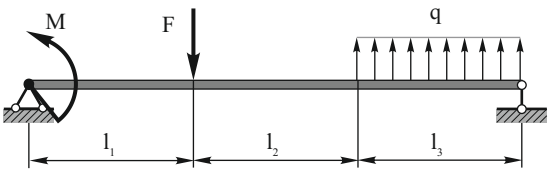


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,6	0,8	0,8	41	43	20	37

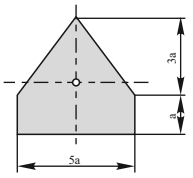
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,5	0,3	1,3	0,3	1,9	0,3	Д6 (О)

5. Designing calculation of strength under bending.



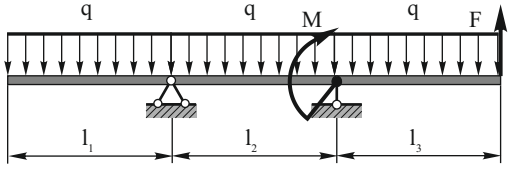
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

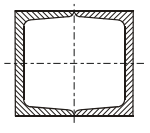
cross section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,2	0,2	16	12	7	СЧ35-56

6. Cheking calculation of beam made of rolled sections.

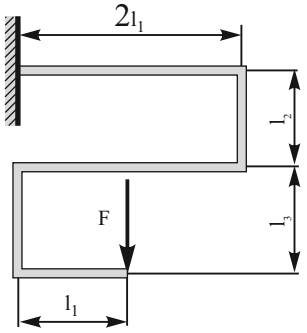




section № 16

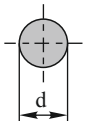
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,6	0,2	0,5	20	36	8	40

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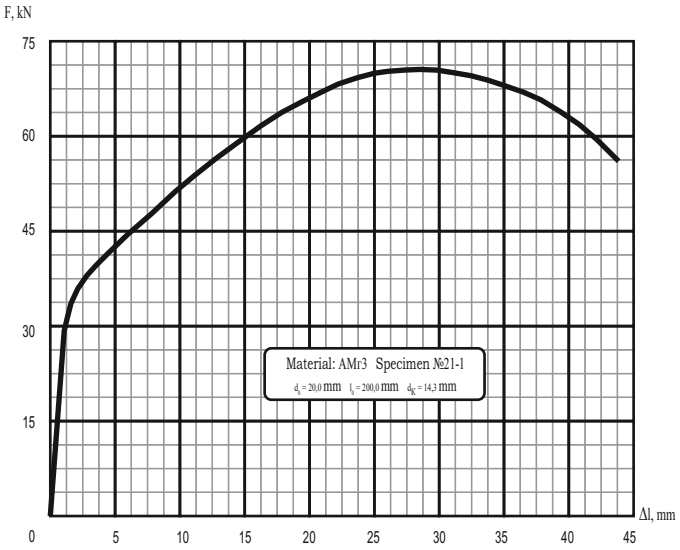
Computational and graphical work of strength of material

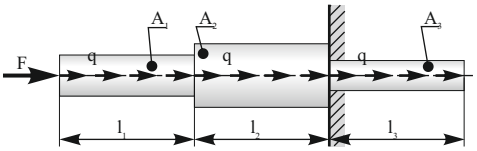
Group	Name and surname	Variant
		9
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



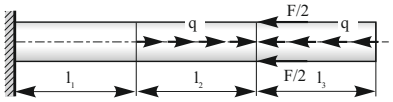
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

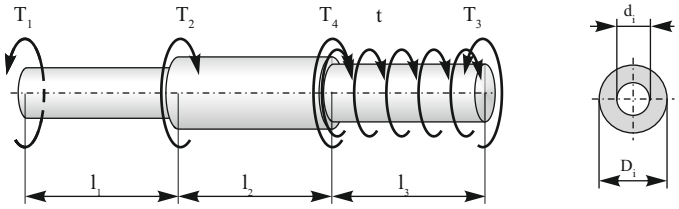
F, kN	l_1, m	l_2, m	l_3, m
25	0,9	0,6	0,7

q, kN/m	A_1/A	A_2/A	A_3/A
11	3,0	2,3	2,8

Additional data for task 3:

Material
15ХСНД
A_4, cm^2
6,3

4. Checking calculation of strength of staged rod under torsion.

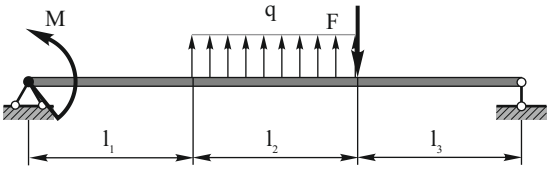


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,4	0,4	0,7	15	40	26	28

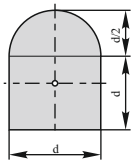
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,4	0,4	1,0	0,4	1,8	0,4	Д6 (З и ЕС)

5. Designing calculation of strength under bending.



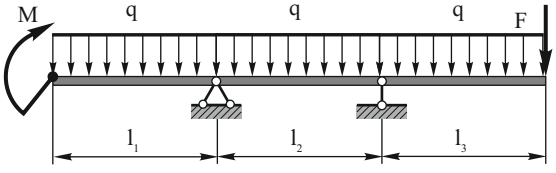
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

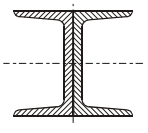
cross section



l_1, m	l_2, m	l_3, m	F, кН	q, кН/м	M, кНм	Материал
0,2	0,2	0,2	15	13	9	СЧ38-60

6. Cheking calculation of beam made of rolled sections.

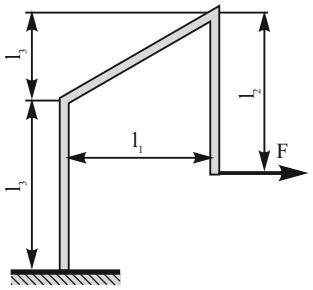




section
№ 16a

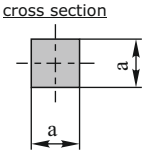
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,2	0,4	0,7	35	46	5	20

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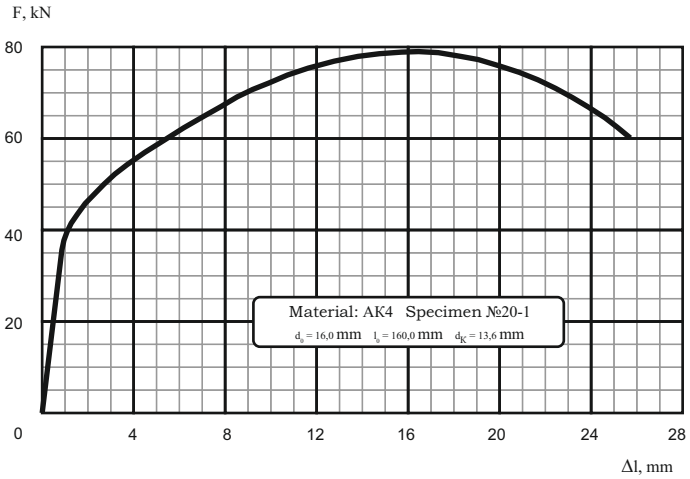
Computational and graphical work of strength of material

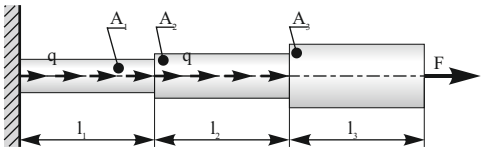
Group	Name and surname	Variant
		10
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



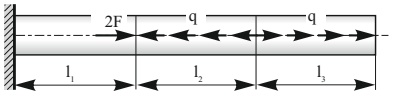
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

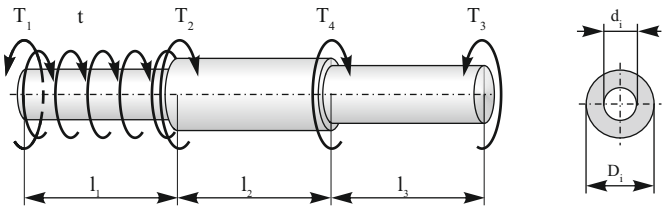
F, kN	l_1, m	l_2, m	l_3, m
30	0,2	0,4	0,1

q, kN/m	A_1/A	A_2/A	A_3/A
11	3,0	1,4	1,1

Additional data for task 3:

Material
30ХГСА
A_4, cm^2
9,9

4. Checking calculation of strength of staged rod under torsion.

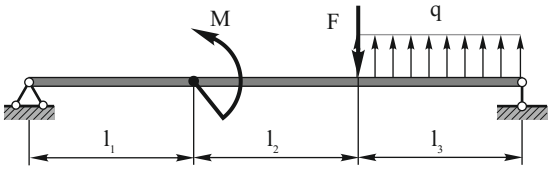


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,5	0,5	0,8	27	14	40	9

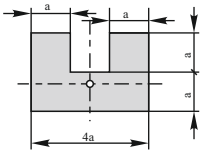
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,9	0,3	1,1	0,3	3,0	0,3	Д16 (О)

5. Designing calculation of strength under bending.



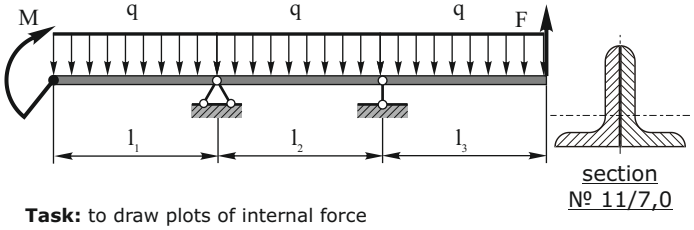
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross section



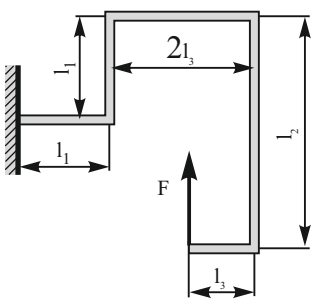
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,1	0,2	30	32	16	ВЧ45-0

6. Cheking calculation of beam made of rolled sections.



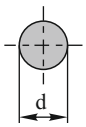
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel brand
0,8	0,7	0,5	13	5	23	30

УГАТУ

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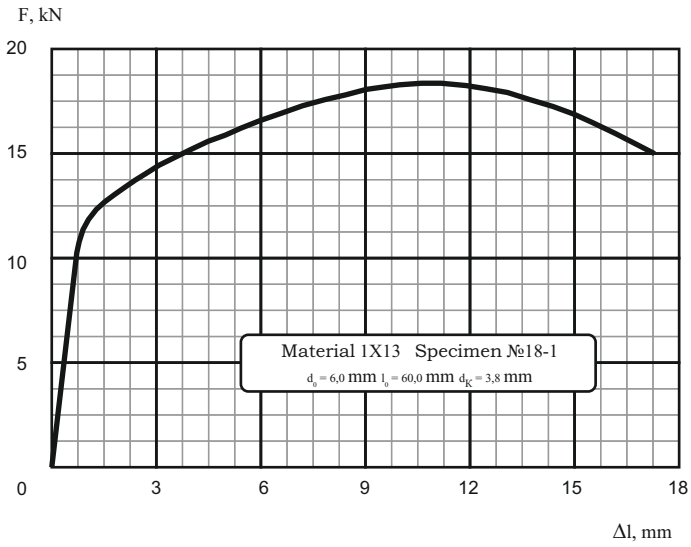
Computational and graphical work of strength of material

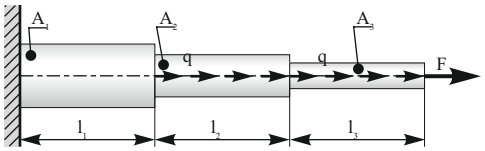
Group	Name and surname	Variant
		11
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



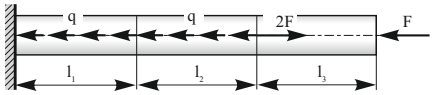
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

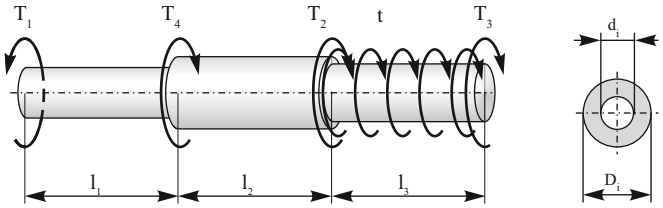
F, kN	l_1, m	l_2, m	l_3, m
32	0,5	0,3	0,2

q, kN/m	A_1/A	A_2/A	A_3/A
10	1,9	1,5	2,5

Additional data for task 3:

Material
1X13
A_4, cm^2
9,2

4. Checking calculation of strength of staged rod under torsion.

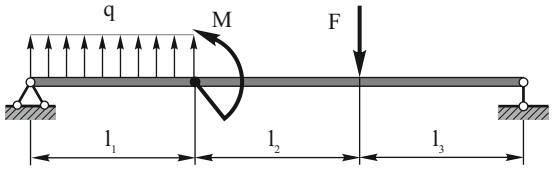


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,6	0,7	0,6	48	39	40	41

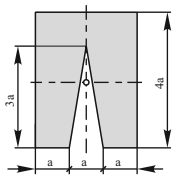
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
3,0	0,2	1,7	0,2	2,0	б/о	Д16 (З и ЕС)

5. Designing calculation of strength under bending.



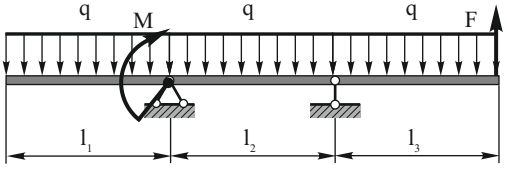
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

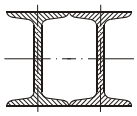
cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
1,2	1,3	1,2	8	7	6	ВЧ50-1,5

6. Cheking calculation of beam made of rolled sections.

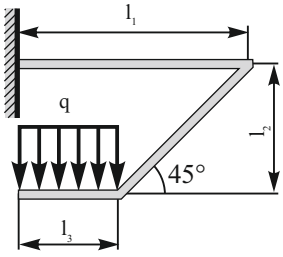




section № 14

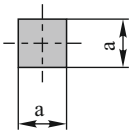
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,8	0,6	0,7	36	15	36	10

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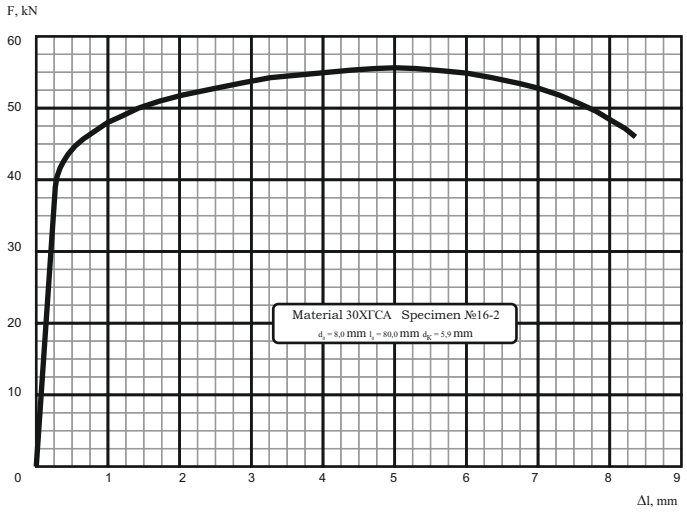
кафедра СОПРОТИВЛЕНИЯ МАТЕРИАЛОВ

Computational and graphical work of strength of material

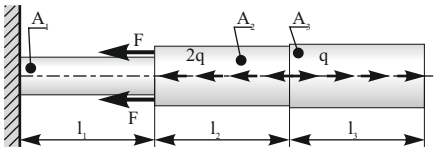
Group	Name and surname	Variant
		12
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



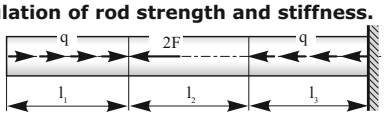
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

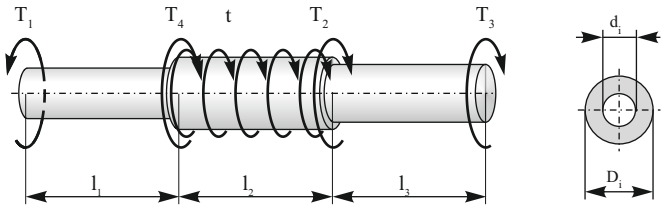
F, kN	l_1, m	l_2, m	l_3, m
26	0,1	0,8	0,2

q, kN/m	A_1/A	A_2/A	A_3/A
13	2,5	2,4	1,4

Additional data for task 3:

Material
45X
A_4, cm^2
5,7

4. Checking calculation of strength of staged rod under torsion.

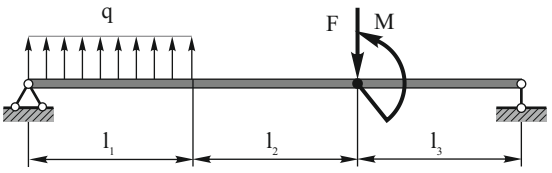


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,5	0,5	0,2	45	15	37	14

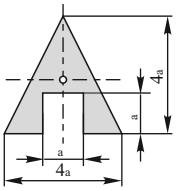
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,8	0,8	2,2	0,8	2,4	б/о	Д16 (С3)

5. Designing calculation of strength under bending.



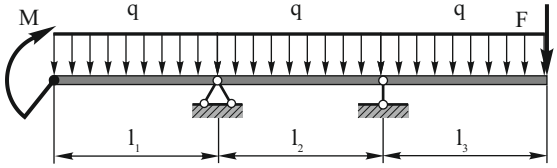
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

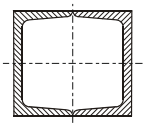
cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
1,1	1,5	0,4	10	4	4	ВЧ60-20

6. Cheking calculation of beam made of rolled sections.

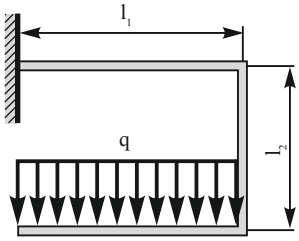




section № 18

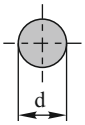
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,2	0,8	0,3	38	27	22	Ст6

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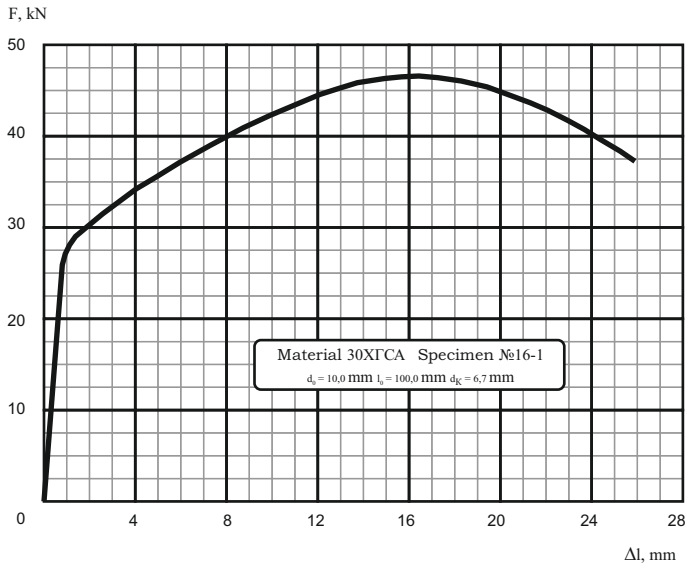
Computational and graphical work of strength of material

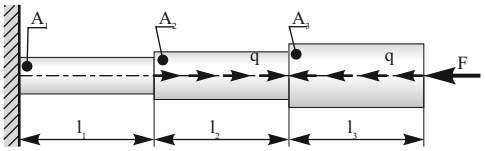
Group	Name and surname	Variant
		13
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



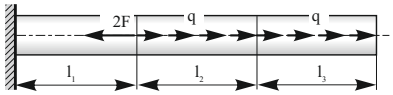
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

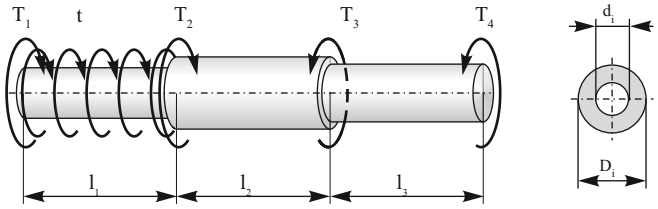
F, kN	l_1, m	l_2, m	l_3, m
22	0,9	1,0	0,6

q, kN/m	A_1/A	A_2/A	A_3/A
12	1,3	1,3	1,3

Additional data for task 3:

Material
30XM
A_4, cm^2
9,7

4. Checking calculation of strength of staged rod under torsion.

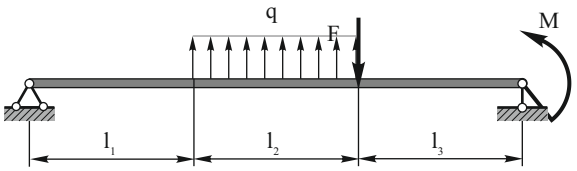


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t, kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,5	0,3	0,3	18	14	48	19

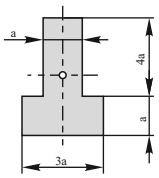
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,8	0,3	1,3	0,3	2,9	б/о	АЛ1

5. Designing calculation of strength under bending.



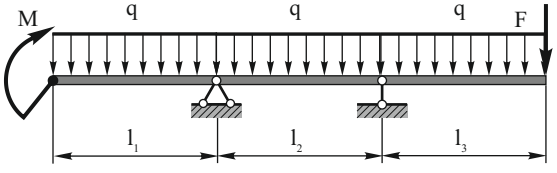
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

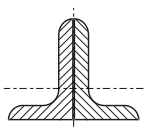
cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
1,0	0,8	1,2	5	10	4	ВЧ45-5

6. Cheking calculation of beam made of rolled sections.

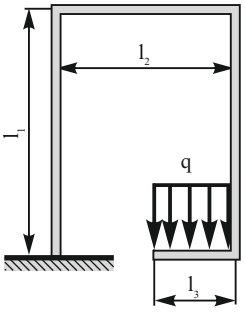




section
№ 12,5/8

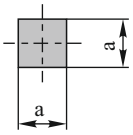
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,3	0,7	0,5	40	6	17	Ст5

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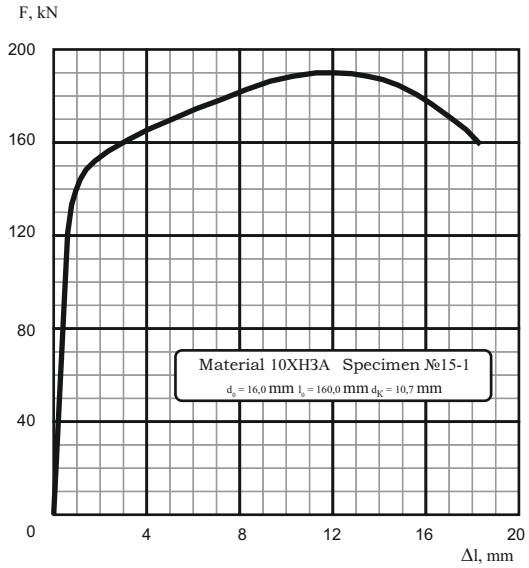
Computational and graphical work of strength of material

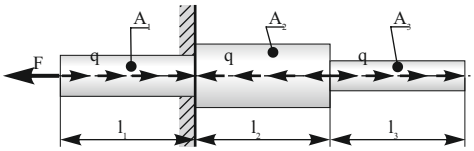
Group	Name and surname	Variant
		14
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



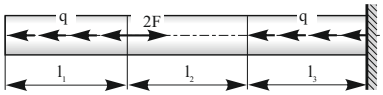
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

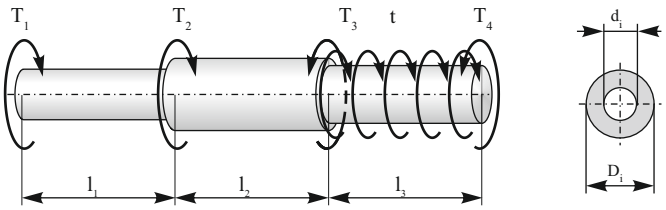
F, kN	l_1, m	l_2, m	l_3, m
30	0,5	0,1	0,5

q, kN/m	A_1/A	A_2/A	A_3/A
17	1,9	1,3	1,5

Additional data for task 3:

Material
40X
A_4, cm^2
7,2

4. Checking calculation of strength of staged rod under torsion.

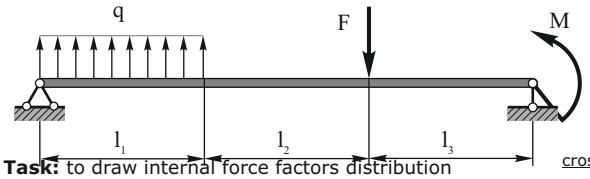


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t, kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,8	0,2	0,5	34	26	26	8

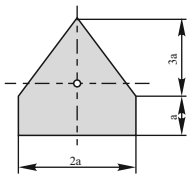
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,9	0,8	1,1	0,8	1,2	б/о	АЛ3

5. Designing calculation of strength under bending.



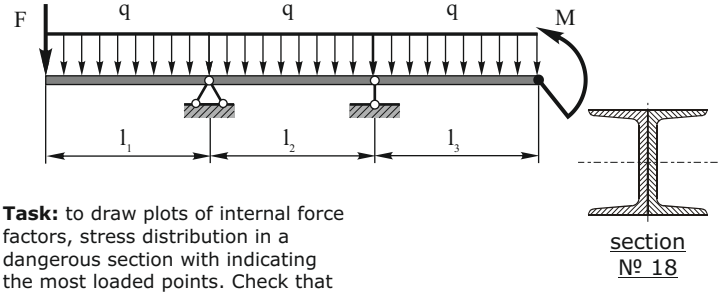
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



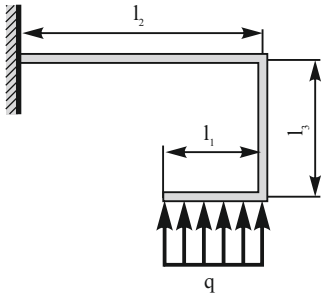
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
1,2	0,8	2,2	22	11	12	ВЧ40-10

6. Cheking calculation of beam made of rolled sections.



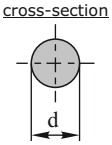
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,2	0,4	0,3	19	22	37	Ст4

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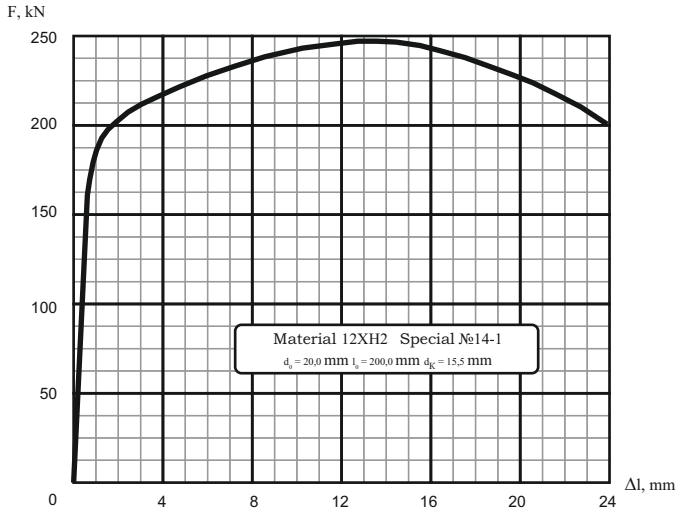
Computational and graphical work of strength of material

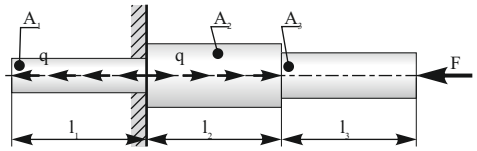
Group	Name and surname	Variant
		15
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



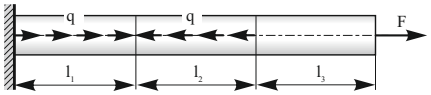
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

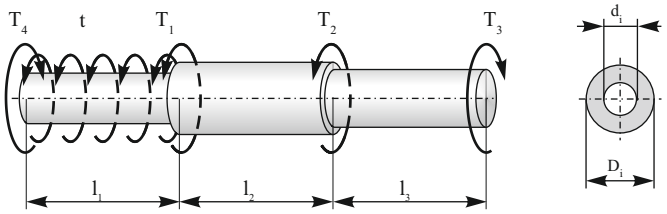
F, kN	l_1, m	l_2, m	l_3, m
25	0,9	0,2	0,2

q, kN/m	A_1/A	A_2/A	A_3/A
17	1,0	2,7	2,2

Additional data for task 3:

Material
20X
A_4, cm^2
7,1

4. Checking calculation of strength of staged rod under torsion.

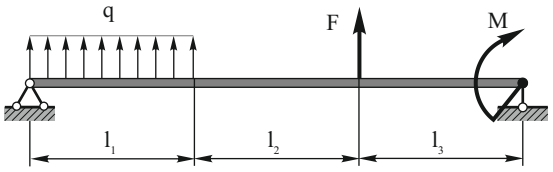


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t, kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,2	0,3	0,5	33	34	41	39

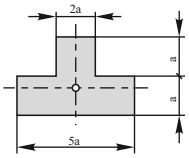
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,3	0,6	1,0	0,6	1,9	б/о	АЛ2

5. Designing calculation of strength under bending.



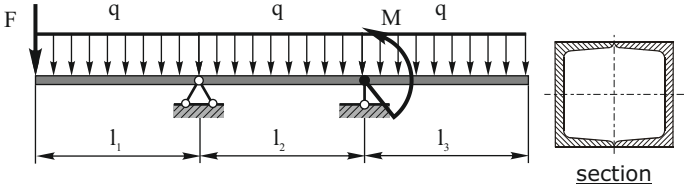
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,1	0,3	0,2	10	14	50	ВЧ50-1,5

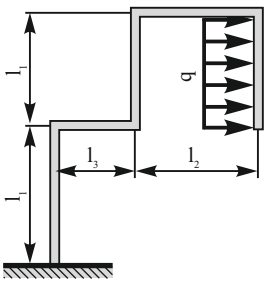
6. Cheking calculation of beam made of rolled sections.



section № 18a

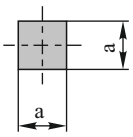
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,2	0,3	0,8	46	46	48	Ст3

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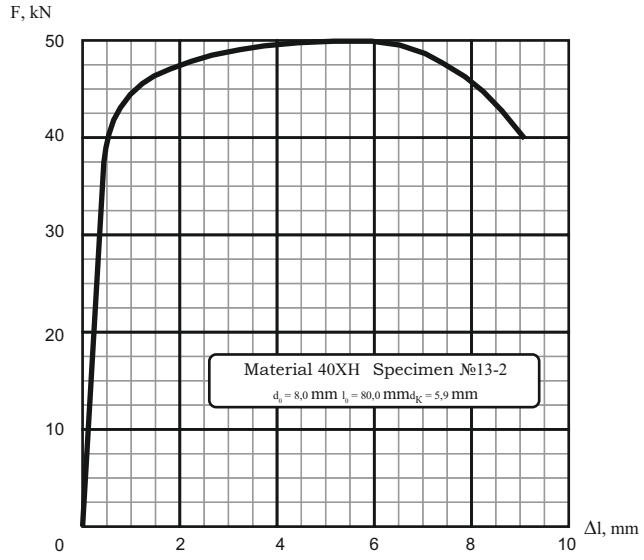
Computational and graphical work of strength of material

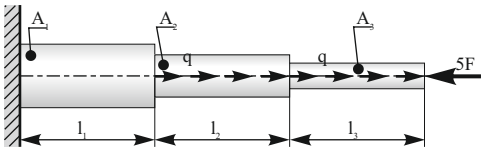
Group	Name and surname	Variant
		16
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



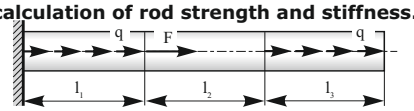
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

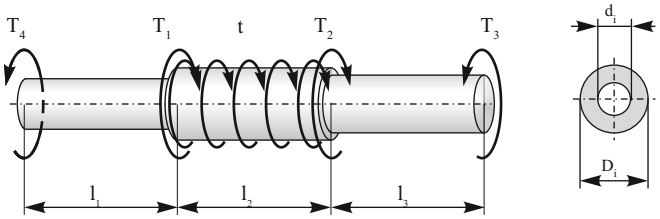
F, kN	l_1, m	l_2, m	l_3, m
39	0,8	0,1	0,6

q, kN/m	A_1/A	A_2/A	A_3/A
14	1,5	2,5	2,6

Additional data for task 3:

Material
60Г
A_4, cm^2
5,4

4. Checking calculation of strength of staged rod under torsion.

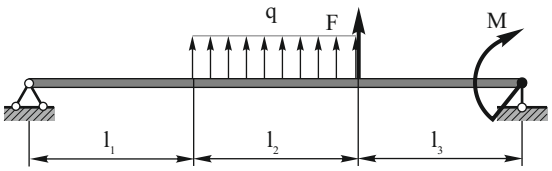


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

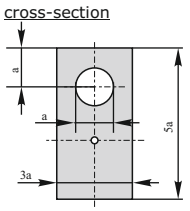
l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,5	0,5	0,6	11	36	32	28

D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,0	0,5	2,7	0,5	1,9	б/о	АЛ8

5. Designing calculation of strength under bending.

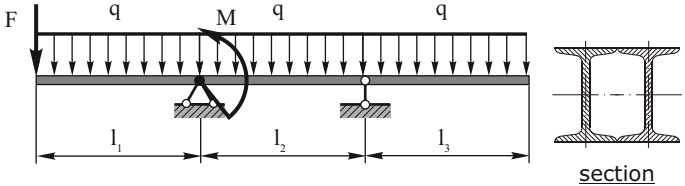


Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,7	0,3	0,2	10	5	5	ВЧ40-10

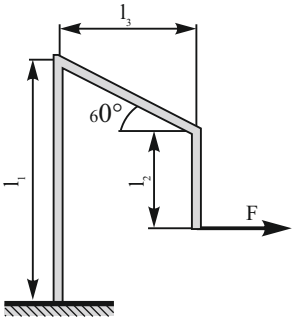
6. Cheking calculation of beam made of rolled sections.



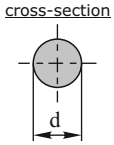
section № 16

Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,6	0,7	0,8	41	11	29	Ст2

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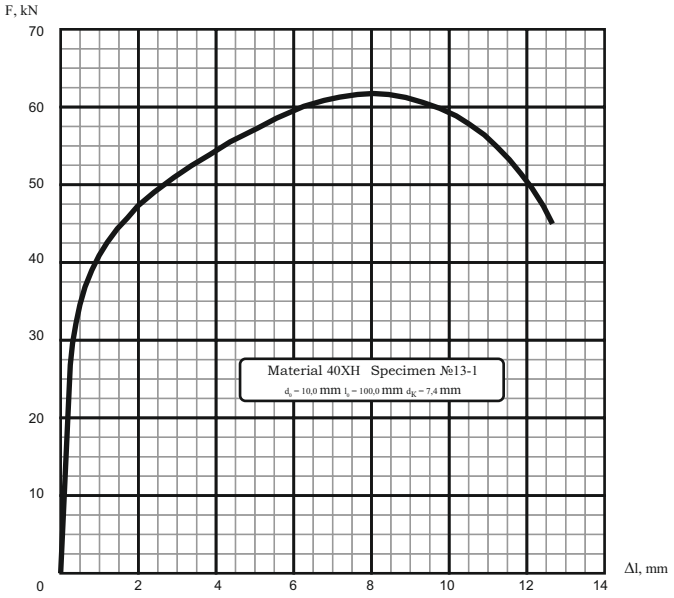
Computational and graphical work of strength of material

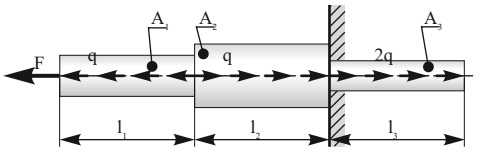
Group	Name and surname	Variant
		17
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



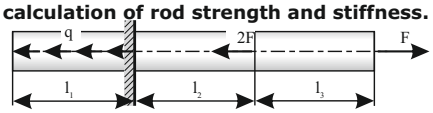
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

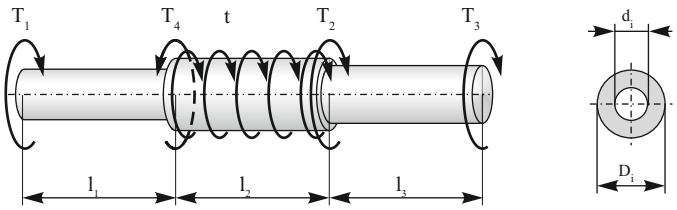
F, kN	l_1, m	l_2, m	l_3, m
24	0,4	0,2	0,2

q, kN/m	A_1/A	A_2/A	A_3/A
19	1,6	1,2	1,2

Additional data for task 3:

Material
30Г
A_4, cm^2
7,5

4. Checking calculation of strength of staged rod under torsion.

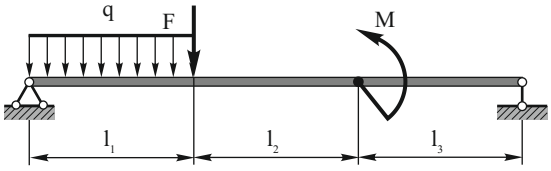


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,3	0,6	0,6	8	12	19	35

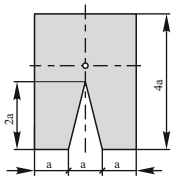
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,7	0,4	2,1	0,4	2,8	б/о	АЛ9

5. Designing calculation of strength under bending.



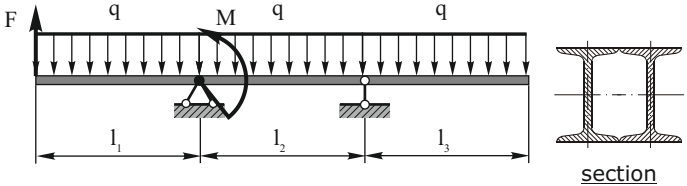
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,7	20	5	5	СЧ38-60

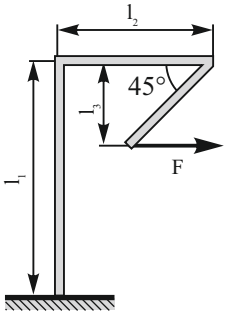
6. Cheking calculation of beam made of rolled sections.



section № 18

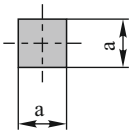
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,4	0,7	0,8	23	30	16	Ст1

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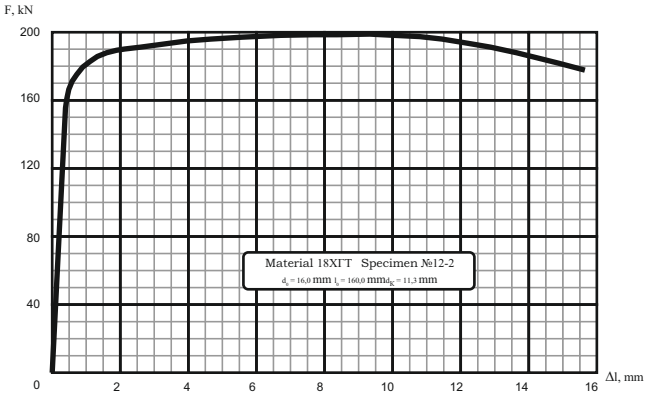
Computational and graphical work of strength of material

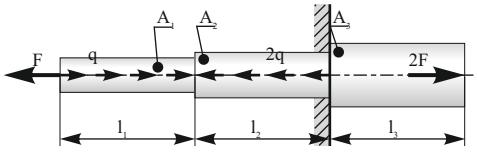
Group	Name and surname	Variant
		18
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



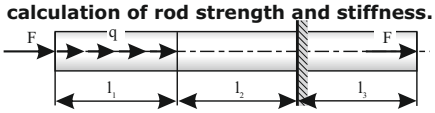
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

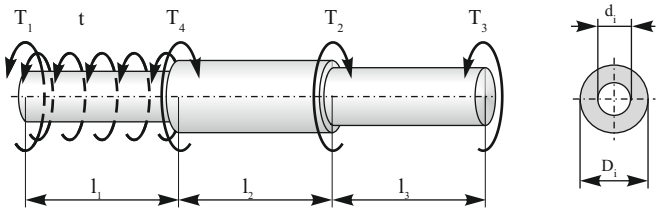
F, kN	l_1, m	l_2, m	l_3, m
23	0,1	0,2	0,6

q, kN/m	A_1/A	A_2/A	A_3/A
15	3,0	1,2	2,8

Additional data for task 3:

Material
ЖС6К
A_4, cm^2
5,7

4. Checking calculation of strength of staged rod under torsion.

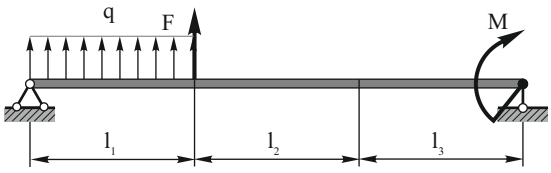


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,7	0,8	0,6	48	18	26	18

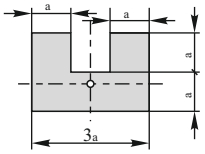
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,2	0,4	1,5	0,4	1,5	б/о	АЛ11

5. Designing calculation of strength under bending.



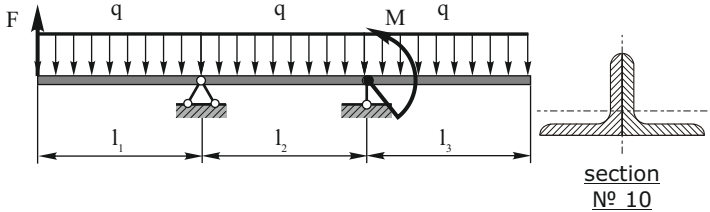
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



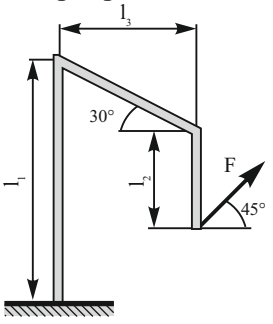
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,9	0,2	20	5	5	ВЧ60-20

6. Cheking calculation of beam made of rolled sections.



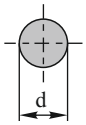
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,5	0,8	0,2	5	38	50	60

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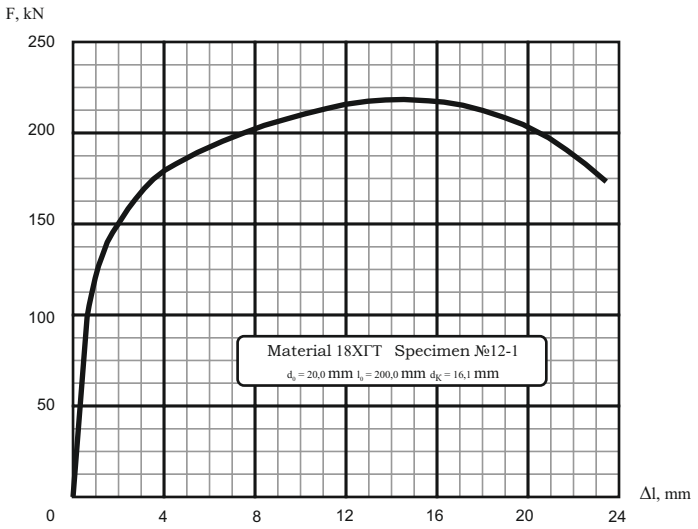
Computational and graphical work of strength of material

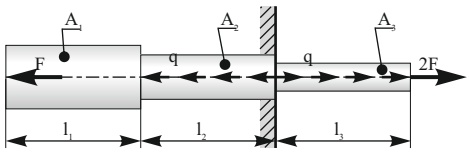
Group	Name and surname	Variant
		19
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



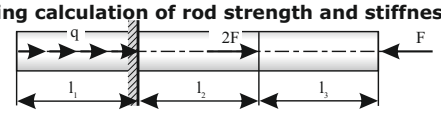
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

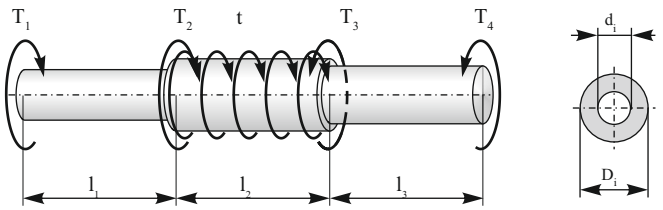
F, kN	l_1, m	l_2, m	l_3, m
26	1,0	0,6	0,5

q, kN/m	A_1/A	A_2/A	A_3/A
18	1,8	1,4	2,8

Additional data for task 3:

Material
1X18H9T
A_4, cm^2
6,5

4. Checking calculation of strength of staged rod under torsion.

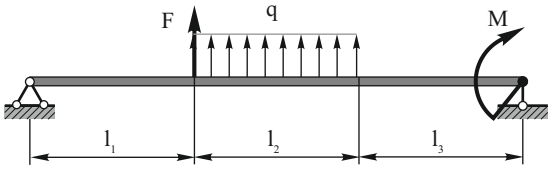


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,2	0,8	0,6	13	29	23	25

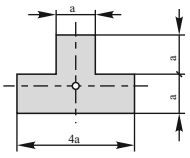
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
2,4	0,6	1,5	0,6	2,4	б/о	АЛ13

5. Designing calculation of strength under bending.



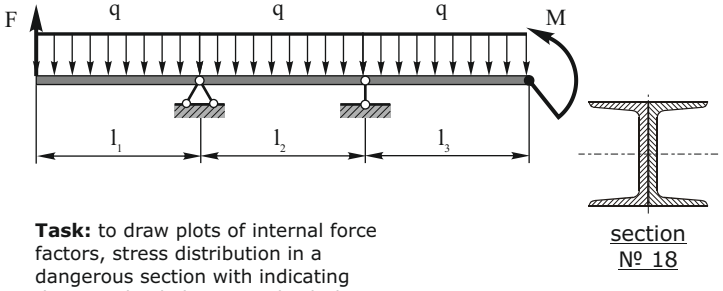
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,2	20	25	5	СЧ35-56

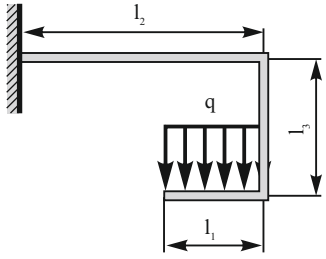
6. Cheking calculation of beam made of rolled sections.



section
№ 18

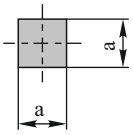
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,6	0,5	0,4	47	44	28	50

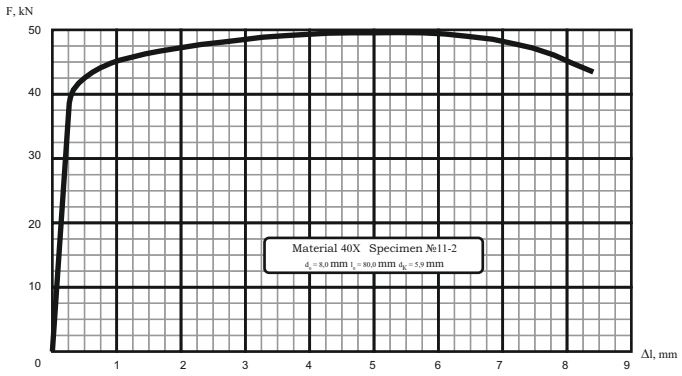
USATU

кафедра СОПРОТИВЛЕНИЯ МАТЕРИАЛОВ

Computational and graphical work of strength of material

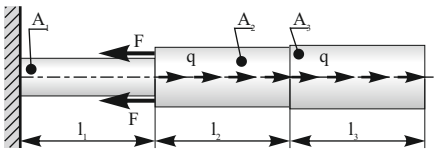
Group	Name and surname	Variant
		20
Date of issue	**Deadline**	**Lecturer**

1. Calculation of physical&mechanical properties of materials.



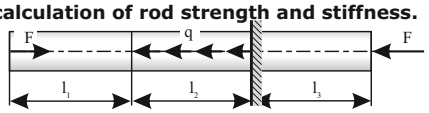
Task: according to a given diagram of material tension, it is necessary to determine the basic mechanical characteristics - the limit of proportionality, yield limit, strength limit, tensile stress. Determine the cross-sectional area of the sample before and after the tests, the relative residual elongation, narrowing. Calculate permissible stresses.

2. Designing calculation of strength of staged rod.



Task: for a given stepped rod it is necessary to build distribution diagrams of longitudinal forces, plot of stresses in fractions of the area cross-section A. Find the cross-sectional area A according to strength conditions. Plot normal stress. Construction material is taken from task 1.

3. Checking calculation of rod strength and stiffness.



Task: for a rod with a constant cross-sectional area A4, it is necessary to plot the longitudinal forces and axial displacements, perform strength and stiffness calculations.

Input data for tasks 2 and 3:

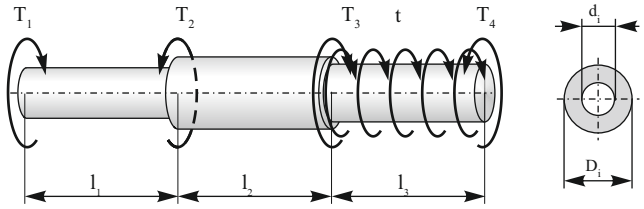
F, kN	l_1, m	l_2, m	l_3, m
21	0,4	0,1	0,4

q, kN/m	A_1/A	A_2/A	A_3/A
15	1,8	2,6	3,0

Additional data for task 3:

Material
1X17H2
A_4, cm^2
7,1

4. Checking calculation of strength of staged rod under torsion.

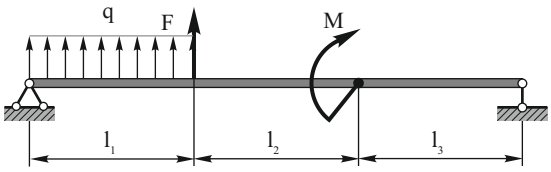


Task: plot torque moments, shear stresses in fractions of d ^ 3. Perform strength analysis and determine the base rod diameter d. Plot relative and absolute rotation angles, shear stresses and distribution diagram of tangential radial stress in a dangerous section.

l_1, m	l_2, m	l_3, m	t,kNm/m	T_1, kNm	T_2, kNm	T_3, kNm
0,7	0,5	0,2	36	36	20	43

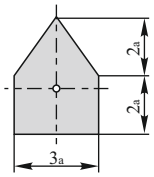
D_1/d	d_1/d	D_2/d	d_2/d	D_3/d	d_3/d	Material
1,0	0,3	3,0	0,3	1,9	б/о	АЛ19

5. Designing calculation of strength under bending.



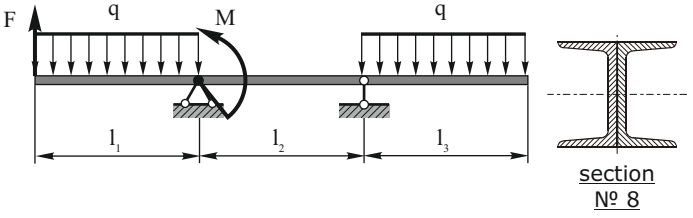
Task: to draw internal force factors distribution diagrams. Match sizes of beam cross section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

cross-section



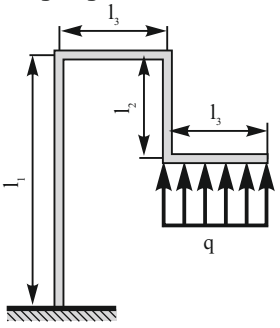
l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,2	20	40	5	СЧ12-28

6. Cheking calculation of beam made of rolled sections.



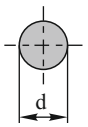
Task: to draw plots of internal force factors, stress distribution in a dangerous section with indicating the most loaded points. Check that the strength condition is met. The section is made of standard rolling sections.

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution indicating the most loaded points. Select a typical size of section according to strength condition.

cross-section



Input data for tasks 6 and 7:

l_1, m	l_2, m	l_3, m	F, kN	q, kN/m	M, kNm	Steel
0,3	0,2	0,5	17	24	31	45