

Group	Name and surname	Variant
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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.

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, \mathbf{m}	l ₂ , 1	n	1 ₃ , m	t, kN	m/m	Т	_l , kNm	T_2 , kN	m	T ₃ , kNm
0,3	0,8	3	0,5	2	2		36	31		15
D ₁ /a	i	d1/	ďd	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,6		0,4	4	3,0	0,4		2,1	0,4		АМцМ

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.

1

nput data fo	r tasks 6 and	7:					
1 ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel brand	
0,7	0,6	0,5	43	41	24	Ст5	

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	1 ₂ , m	1 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	

cross section

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	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,2	20	5	5	СЧ12-28

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution Select a typical size of section according to

indicating the most loaded points. strength condition.





Group	Name and surname	Variant
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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.

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.

1 ₁ , n	1 1	2, m	1 ₃ , 1	m	t,kN	m/m	Т	_l , kNm	T_2 , kN	m	T ₃ , kNm
0,8		0,8	0,3	3	1	4		43	48		28
D	/d	d	l/d		D_2/d	d ₂ /	d	D ₃ /d	d ₃ /d		Material
1,4	1	0	,3		1,9	0,3		2,4	0,3		АМг2М

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.

<u>Section</u> № 10/6,3

Input data for tasks 6 and 7:

		-				
1 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

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:

for task
Material
40X
A_4 , cm^2
9,3

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.

1 ₁ , m	l_2, m	13, m	F, kN	q, kN/m	M, kNm	Material
0,3	0,1	0,2	25	15	21	СЧ15-32

cross section

7. Designing calculation of strength of plane frame.





Group	Name and surname	Variant
		3
Date of issue	Deadline	Lecturer

1. Calculation of physical&mechanical properties of materials.



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.

1₂, m

1,0

 A_2/A

1,6

1., m

0,4

A₃/A

1,9

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.

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	1 ₃ , m	t,kNm/m		T ₁ , kNm		T_2 , kN	m	T ₃ , kNm
0,6	0,6	0,2	2	8		21	15		27
D ₁ /a	l 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

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.



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.

			a
			 a
- 3a	-	3a	 ł

cross section

2a

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

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force factors distribution, hazardous section stress distribution Select a typical size of section according to

Steel brand

Ст3

indicating the most loaded points. strength condition.





q, kN/m

38

	-+-	8
<u> </u>	I	
	a -	

M, kNm

39

Ing	Input data for tasks 6 and 7:									
	l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN						
	0,3	0,2	0,5	40						

Additional data for task 3:

Material
45X
A_4 , cm ²
8,4

Designing	calculation	of	strength	under	bending.
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Input data for tasks 2 and 3:

1,, m

0,2

A₁/A

2,6

F, kN

20

q, kN/m

11

5.



Group	Name and surname	Variant		
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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.

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	1 ₂ , m	13, I	n t,kN	t,kNm/m		₁ , kNm	T_2 , kN	m	T ₃ , kNm
0,2	0,8	0,7	7 1	6	32		47		13
D ₁ /a	d d	_1/d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,9	0	,7	2,0	0,7	/	1,7	0,7		АМг6

6. Cheking calculation of beam made of rolled sections.



Input data for tasks 6 and 7:

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.

l ₁ , m	I ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,1	0,1	10	15	5	СЧ21-40

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



Material

for task 3:

5.	Designing	calculation	of	strength	under	bending.
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 l_2, m



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.

0,4 0,5 A_2/A A₃/A 1,5 1,1

1., m

Additional data

30XM
A_4 , cm ²
6,3

Ŷ	

1 1

cross section



1 ₁ , m	1 ₂ , m	l_3, m	f, kN	q, kN/m	M, kNm	Steel brand
0,5	0,6	0,8	30	8	48	Ст2



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,

perform strength and stiffness calculations.

1,, m

0,4

A₁/A

1,4

Input data for tasks 2 and 3:

F, kN

24

q, kN/m

13

1

it is necessary to plot the longitudinal forces and axial displacements,



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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.

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	1 ₃ , m	t,kNm/m		T ₁ , kNm		T ₂ , kNm		T ₃ , kNm		
0,8	0,8	0,3	1	1		1		41	5		44
D_1/d d_1/d D_2/d		d2/	d	D ₃ /d	d ₃ /d		Material				
3,0	0	0,7 1,3 0,7		'	2,3	0,7		АМг6М			

6. Cheking calculation of beam made of rolled sections.



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.

section <u>Nº 8</u> Input data for tasks 6 and 7:

l ₁ , m	l ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel brand
0,6	0,6	0,7	25	35	10	Ct1

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.

F	

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 1,, m l_2, m 1., m 0,7 1,0 0,7 15 q, kN/m A₁/A A₂/A A₃/A 16 2,4 2,3 1,5

Additional data for task 3:

Material
40XH
A_4 , cm^2
5,2

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.

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		1			1
					1
	_	3a	-		

I ₁ , m	1 ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,1	0,3	0,4	10	50	5	СЧ24-44

7. Designing calculation of strength of plane frame.









Name and surname Group 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.

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



Task: plot torgue 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	13, m	t,kN	t,kNm/m		_l , kNm	T ₂ , kNm		T ₃ , kNm		
	0,5	0,8	0,5	1	16		16		42	29		32
	D ₁ /a	l d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material		
2,1		0	,3	2,7	0,3		3,0	0,3		Д1 (О)		

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.

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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	1 ₁ , m	1 ₂ , m	1 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:

7	
	Material
	12XH3A
	A_4 , cm ²
	6,9

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.

I ₁ , m	1 ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,1	0,1	0,4	10	60	20	СЧ28-48

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

ipat aata ioi t							
l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel brand	
0,2	0,6	0,3	20	36	8	60	

Input data for tasks 6 and 7



Group	Name and surname	Variant
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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.

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	13, n	ı t,kN	m/m	T	_l , kNm	T_2 , kN	m T_3 , kNm
0,7	0,4	0,4	1	6		46	49	34
D ₁ /a	d d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d	Material
1,5	0	,7	1,5	0,7	1	1,7	0,7	Д1П (3 и EC)

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.



Input data for tasks 6 and 7:

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.

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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	1 ₂ , m	1 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

5. Designing calculation of strength under bending.



7. Designing calculation of strength of plane frame.





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



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.

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



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,kN	m/m	Т	_l , kNm	T_2 , kN	$m \mid T_3, kNm$
0,6	0,8	0,8	4	1	43		20	37
D ₁ /d	l d	/d	D_2/d	d2/	d	D ₃ /d	d ₃ /d	Material
2,5	0	,3	1,3	0,3		1,9	0,3	Д6 (О)

6. Cheking calculation of beam made of rolled sections.



Input data for tasks 6 and 7:

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.

Task: plot torque moments, shear stresses in fractions of d ^ 3.

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	Task: to draw intern diagrams. Match size	al force faces of beam

according to stren dangerous section noticing the most loaded points. Suggest the section position best option.

						-
I ₁ , m	1 ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,2	0,2	16	12	7	СЧ35-56

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



Additional data for task 3:

Material
40XHMA
A_4 , cm ²
8.9

5. Designing calculation of strength under bending.



Task: for a rod with a constant cross-sectional area A4,

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.

Task: for a given stepped rod it is necessary to build distribution

3. Checking calculation of rod strength and stiffness.

2. Designing calculation of strength of staged rod.

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	1 ₁ , m	1 ₂ , m	1 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

40XHMA
A_4 , cm ²
8,9

cross section

	l ₂	l ₃	
erna sizes ngth n stre	I force factors dis of beam cross se conditions. Plot ess distribution w	tribution ection ith	-1

q

l ₁ , m	I ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Steel brand
0,6	0,2	0,5	20	36	8	40



Group	Name and surname	Variant
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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.

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	1 ₃ , n	ı t,kN	m/m	Т	_l , kNm	T_2 , kN	m T ₃ , kNm
0,4	0,4	0,7	1	5		40	26	28
D ₁ /a	i d	_l /d	D_2/d	d2/	ď	D ₃ /d	d ₃ /d	Material
1,4	0	,4	1,0	0,4	ŀ	1,8	0,4	Д6 (3 и EC)

6. Cheking calculation of beam made of rolled sections.



Input data for tasks 6 and 7:

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.

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.

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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	1 ₂ , m	1 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

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.

I ₁ , m	1 ₂ , m	1 ₃ , m	F, KH	q, кН/м	М, кНм	Материал
0,2	0,2	0,2	15	13	9	СЧ38-60

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.



l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel brand
0,2	0,4	0,7	35	46	5	20

cross section





Group	Name and surname	Variant
		10
Date of issue	Deadline	Lecturer

2. Designing calculation of strength of staged rod.

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.

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	1 ₃ , m	t,kN	m/m	Т	_l , kNm	T_2 , kN	m	T ₃ , kNm
0,5	0,5	0,8	2	7		14	40		9
D ₁ /a	l d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
1,9	0	,3	1,1	0,3		3,0	0,3	,	Д16 (О)

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.

Input data for tasks 6 and 7:

 l_2, m

0,7

1, m

0,8



F, kN

13

13, m

0,5

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.

Steel brand

30

cross section

M, kNm

23

7. Designing calculation of strength of plane frame.

Additional data

Material	
30ХГСА	
A_4 , cm ²	
9.9	

5. Designing calculation of strength under bending.

 l_2, m

0,4

 A_2/A

1,4

Input data for tasks 2 and 3:

1,, m

0,2

A₁/A

3,0

F, kN

30

q, kN/m

11



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	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,1	0,2	30	32	16	ВЧ45-0

q, kN/m

5

Material
30ХГСА
A_4 , cm ²
9,9

for task 3:

30ХГСА
A_4 , cm ²
9,9

cross section

0.1	14
0,1	302
A ₃ /A	A ₄ ,
1,1	

1., m



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.

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, \mathbf{m}	l_2, m	13, m	ı t,kN	t,kNm/m		_l , kNm	T ₂ , kNm		T ₃ , kNm	
0,6	0,7	0,6	4	8		39	40		41	
D ₁ /a	d d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material	
3,0	0	,2	1,7	0,2	2	2,0	б/о	Д	16 (3 и EC)	

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.

Input data for tasks 6 and 7:

l_1, m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel
0,8	0,6	0,7	36	15	36	10

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	1 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	

cross-section

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

in be.				¥ ->		
m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material	
3	1,2	8	7	6	ВЧ50-1,5	

7. Designing calculation of strength of plane frame.



1, m

1,2

¹2,

1,3







Group	Name and surname	Variant
		12
Date of issue	Deadline	Lecturer

2. Designing calculation of strength of staged rod.

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.

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	1 ₃ , m	t,kN	t,kNm/m		_l , kNm	T ₂ , kNm		T ₃ , kNm	
0,5	0,5	0,2	4	5		15	37		14	
D ₁ /a	l d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material	
2,8	0	,8	2,2	0,8	;	2,4	б/о	Į	I16 (C3)	

6. Cheking calculation of beam made of rolled sections.



Input data for tasks 6 and 7:

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.

	l l_2
Task: to draw inter diagrams. Match siz	nal force factors

ss section according to strength conditions. Plot dangerous section stress distribution with noticing the most loaded points. Suggest the section position best option.

I ₁ , m	1 ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
1,1	1,5	0,4	10	4	4	ВЧ60-20

7. Designing calculation of strength of plane frame.



Task: to draw plots of internal force ss distribution ided points. Select a typical size of section according to strength condition.





	factors di	strib	ution,	
	hazardou	s sec	ction s	stre
	indicating	the	most	loa
I T	<u> </u>			~



	//////						111
-		1,		12		1,	
D	-		> <				
	Task: to	draw in	ternal for	rce facto	ors distrib	ution	

Additional data for task 3:

Material
45X
A_4 , cm ²
5.7

cross-section

5. Designing calculation of strength und



Input data for tasks 2 and 3:

2F

it is necessary to plot the longitudinal forces and axial displacements perform strength and stiffness calculations.

f, kN	l_1, m	1 ₂ , m	1 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

Iviaterial	
45X	
A_4 , cm ²	
5.7	

,4	5,7
ler bending.	

1 ₁ , m	l ₂ , m	1 ₃ , m	f, kN	q, kN/m	M, kNm	Steel
0,2	0,8	0,3	38	27	22	Стб



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

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.

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	l_1, m	1 ₂ , m	13, m	t, kN	m/m	T	₁ , kNm	T_2 , kN	m T_3 , kNm
	0,5	0,3	0,3	1	8		14	48	19
[D ₁ /d	i d	_l /d	D ₂ /d	d ₂ /	d	D ₃ /d	d ₃ /d	Material
ĺ	2,8	0	,3	1,3	0,3	6	2,9	б/о	АЛ1

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.



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.

 	-	_q		-	- q -	-
(¹ ,	 -	12	-	-	1,	

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 1,, m l_2, m 1., m 22 0,9 1,0 0,6 q, kN/m A₁/A A₂/A A₃/A 12 1,3 1,3 1,3

Additional data for task 3:

Material
30XM
A_4 , cm ²
9,7

cross-section

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.

I ₁ , m	I ₂ , m	l ₃ , m	F, kN	q, kN/m	M, kNm	Material
1,0	0,8	1,2	5	10	4	ВЧ45-5

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:

1 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



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.

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	1 ₃ , m	t, kNı	m/m	Т	_l , kNm	T_2 , kN	m T_3 , kNm		
0,8	0,2	0,5	3	34		4		26	26	8
D_1/d d_1/d D_2		D_2/d	d ₂ /	d	D ₃ /d	d ₃ /d	Material			
1,9	1,9 0,8 1,1 0		0,8	;	1,2	б/о	АЛЗ			

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.

section № 18

13, m

0,3

Input data for tasks 6 and 7:

 l_2, m

0,4



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.

-	- q -	2F				-q -	-
-	1,	-	12	-	•	1,	-

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 1,, m 1₂, m 1., m 0,5 30 0,10,5 q, kN/m A₁/A A₂/A A₃/A 17 1.9 1,3 1,5

Additional data for task 3:

Material
40X
A_4 , cm^2
7,2

5. Designing calculation of strength under bending.



ВЧ40-10 1,2 2,2 0,8 22 11 12

7. Designing calculation of strength of plane frame.



19

Task: to draw plots of internal force factors distribution, Select a typical size of section according to

Steel

Ст4

hazardous section stress distribution indicating the most loaded points. strength condition.

L	q	d	
F, kN	q, kN/m	M, kNm	

22

cross-section

37

1,, m

0,2



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.

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	1 ₃ , m	t, kN	m/m	T	_l , kNm	T_2 , kN	m T_3 , kNm
0,2	0,3	0,5	3	33		34		39
D ₁ /d	D_1/d d_1/d D_2/d		D_2/d	d2/	d	D ₃ /d	d ₃ /d	Material
2,3	0	0,6 1,0 0,		0,6	5	1,9	б/о	АЛ2

6. Cheking calculation of beam made of rolled sections.



Input data for tasks 6 and 7:

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.

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.

2. Designing calculation of strength of staged rod.

	-	•••		←			 F
1 1	-	-	12		(l ₃	

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 1,, m 1₂, m 1., m 25 0,9 0,2 0,2 q, kN/m A₁/A A₂/A A₃/A 17 1.0 2,7 2,2

Additional data for task 3:

Material
20X
A_4 , cm ²
7,1

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.

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

7. Designing calculation of strength of plane frame.





l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel
0,2	0,3	0,8	46	46	48	Ст3







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.

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	1 ₃ , m	t,kN	m/m	Т	_l , kNm	T_2 , kN	m	T ₃ , kNm
0,5	0,5	0,6	1	1	36		5 32		28
D ₁ /a	d d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,0	0	,5	2,7	0,5	;	1,9	б/о		АЛ8

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.

Input data for tasks 6 and 7:

1 ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel		
0,6	0,7	0,8	41	11	29	Ст2		

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	I ₁ , m	1 ₂ , m	1 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 3:

tor task a
Material
60Г
A_4 , cm ²
5,4

5. Designing calculation of strength under bending.



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	1 ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,7	0,3	0,2	10	5	5	ВЧ40-10

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

2. Designing calculation of strength of staged rod.

G	Group	Name and surname	Variant
кафелра			17
РОТИВЛЕНИЯ	Date of issue	Deadline	Lecturer
МАТЕРИАЛОВ			

1. Calculation of physical&mechanical properties of materials. $_{\rm F,\,kN}$

USATU



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.

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	1 ₂ , m	1 ₃ , m	t,kN	m/m	Т	_l , kNm	T_2 , kN	m	T ₃ , kNm
0,3	0,6	0,6	8	3		12	19		35
D ₁ /a	i d	l/d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,7	0	,4	2,1	0,4	ł	2,8	б/о		АЛ9

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.

Input data for tasks 6 and 7:

	3. Checking calculation of rod strength and stiffness.
	q 4 4 4 4 − − − − F
3-1	
	Task: for a rod with a constant cross-sectional area A4,

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.

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.

Input data for tasks 2 and 3:

F, kN	I ₁ , m	1 ₂ , m	1 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:

ioi tusk a	
Material	
30Г	
A_4 , cm ²	
7,5	

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
0,2	0,3	0,7	20	5	5	СЧ38-60

7. Designing calculation of strength of plane frame.





l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel
0,4	0,7	0,8	23	30	16	Ст1



Group	Name and surname	Variant		
		18		
Date of issue	Deadline	Lecturer		

1. Calculation of physical&mechanical properties of materials.



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.

F		q				F
	-	1,	 -	12	l1	

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.

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.

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, \mathbf{m}	1 ₂ , m	1 ₃ , m	t,kN	m/m	Т	₁ , kNm	T_2 , kN	m	T ₃ , kNm
0,7	0,8	0,6	4	8		18	26		18
D ₁ /d	i d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,2	0	,4	1,5	0,4	ŀ	1,5	б/о		АЛ11

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.

Input data f	for tasks 6 and	d 7:				
l ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel
0.5	0.8	0.2	5	38	50	60

Input data for tasks 2 and 3:

F, kN	I ₁ , m	1 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

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.

I ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,9	0,2	20	5	5	ВЧ60-20

7. Designing calculation of strength of plane frame.







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.

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	1 ₃ , m	t,kN	m/m	Т	₁ , kNm	T_2 , kN	m	T ₃ , kNm
0,2	0,8	0,6	1	3		29	23		25
D ₁ /a	d d	_l /d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
2,4	0	,6	1,5	0,6	,	2,4	б/о		АЛ13

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.

<u>section</u> <u>№ 18</u>

Input data for tasks 6 and 7:

I ₁ , m	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Steel
0,6	0,5	0,4	47	44	28	50

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	1 ₂ , m	1 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	

cross-section

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.

					-	4a 🗲
, m	l ₂ , m	I ₃ , m	F, kN	q, kN/m	M, kNm	Material
) 2	03	0.2	20	25	5	СЧ35-56

7. Designing calculation of strength of plane frame.







Group	Name and surname	Variant		
		20		
Date of issue	Deadline	Lecturer		

1. Calculation of physical&mechanical properties of materials.



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.

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.

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, \mathbf{m}	1 ₂ , m	1 ₃ , m	t,kNm/m		Т	_l , kNm	T ₂ , kNm 20		T ₃ , kNm
0,7	0,5	0,2	3	36		36 36			43
D ₁ /d	d d	1/d	D_2/d	d2/	d	D ₃ /d	d ₃ /d		Material
1,0	0	,3	3,0	0,3		1,9	б/о		АЛ19

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.

Input data for tasks 6 and 7:

<u>Nº 8</u>		
		q -(-+-)-
	,	

F, kN 1,, m l_2, m 1,, m 0,4 0,4 21 0,1q, kN/m A₁/A A₂/A A₃/A 15 1,8 2,6 3,0

Input data for tasks 2 and 3:

Additional data for task 3:

Material				
1X17H2				
A_4 , cm ²				
7,1				

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	1 ₂ , m	1 ₃ , m	F, kN	q, kN/m	M, kNm	Material
0,2	0,3	0,2	20	40	5	СЧ12-28

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.

ross-section

d

Input uata	UI LASKS U AII	u /.		-		
1 ₁ , m	1 ₂ , m	1 ₃ , m	f, kN	q, kN/m	M, kNm	Steel
0,3	0,2	0,5	17	24	31	45