**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 1** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 2** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 3** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 4** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 5** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 6** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 7** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 8** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 9** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 10** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 11** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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---

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 12** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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---

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 13** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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---

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 14** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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---

**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 15** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 16** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 17** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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---

**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 18** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 19** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 20** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 21** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 22** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 23** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 24** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 25** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 26** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 27** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 28** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 29** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 30** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

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**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 31** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 32** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 33** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 34** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 35** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

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**Variant: 36** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 37** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 38** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 39** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 40** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 41** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 42** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 43** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 44** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 45** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 46** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 47** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 48** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 49** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 50** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 51** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 52** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 53** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 54** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 55** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 56** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 57** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 58** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 59** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 60** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 61** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 62** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 63** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 64** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 65** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 66** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 67** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 68** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 69** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 70** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 71** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 72** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 73** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 74** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 75** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 76** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 77** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 78** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 79** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 80** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 81** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 82** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 83** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 84** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 85** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 86** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 87** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 88** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 89** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 90** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 91** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 92** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 93** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 94** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 95** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Full name of the student, group**

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**Variant: 96** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 97** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 98** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 99** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 100** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 101** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 102** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 103** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

---

**Variant: 104** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Full name of the student, group**

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**Variant: 105** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 106** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 107** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 108** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 109** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 110** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 111** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Variant: 112** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 113** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 114** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 115** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 116** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 117** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Department of aircraft strength**

**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 118** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 119** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

---

**Variant: 120** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Subject:** mechanics of materials
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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 121** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 122** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 123** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 124** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 125** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Full name of the student, group**

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**Variant: 126** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

---

**Variant: 127** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

---

**Mark:**

**National aerospace university**
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**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 128** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

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**Variant: 129** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

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**Variant: 130** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

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**Variant: 131** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Variant: 132** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

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**Variant: 133** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

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**Variant: 134** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Variant: 135** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Variant: 136** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

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**Variant: 137** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 138** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

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5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Variant: 139** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 140** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

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**Subject:** mechanics of materials
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**Full name of the student, group**

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**Variant: 141** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 142** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 143** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 144** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Subject:** mechanics of materials
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**Variant: 145** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 146** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Variant: 147** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Variant: 148** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**

**National aerospace university**
**"Kharkiv Aviation Institute"**
**Department of aircraft strength**

**Subject:** mechanics of materials
**Document:** home problem
**Topic:** Stress Analysis of Two Supported Beams in plane Bending.

**Full name of the student, group**

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**Variant: 149** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

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**Full name of the student, group**

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**Variant: 150** **Complexity: 1**

**Given:** $[\sigma]_t$=160 MPa; $[\sigma]_c = 200$ MPa; $h/b = 2$ for rectangle cross-section.

**Goal:**

1) copy from home problem No5 the graphs of shear forces and bending moments;

2) using condition of strength in pure bending calculate: a) diameter of round solid cross-section; b) diameters of hollow tube cross-section using thickness ratio $\alpha = d/D = 0{,}8$; c) dimensions of rectangle solid cross-section in $h/b = 2$; d) dimensions of hollow rectangle cross-section in $H/h = 2$; $B/b = 2$; e) number of I-beam section;

3) compare the weights of 5 cross-sections mentioned in p. 2;

4) design the graphs of acting stresses in cross-section with the largest shear force for 5 cross-sections mentioned in p.2;

5) estimate the type of stress state in the following points of I-beam section: a) lying on neutral axis; b) belonging to the most tensile or compressed layers of the section (choose yourself); c) in the point of the flange and web connection (one of two existing connections). Note, that the point must belong to the web.

**Full name of the lecturer** **signature**

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**Mark:**