Code.No: 07A40102 | R07 | SET-1

**II B.TECH – II SEM EXAMINATIONS, DECEMBER - 2010**
**STRENGTH OF MATERIALS – II**
**(CIVIL ENGINEERING)**

**Time: 3hours** **Max.Marks:80**

**Answer any FIVE questions**
**All questions carry equal marks**
- - -

1. Using the Mohr's circle, for the state of stress shown in figure 1, determine
i) The plane of action and the magnitude of principal stresses,
ii) Maximum shear stress and
iii) The stresses acting on a plane making $30^0$ in clockwise direction with respect to x-axis. [16]

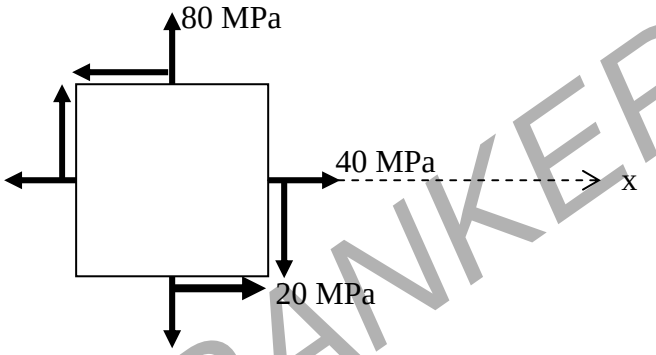


Figure 1

2. A solid circular shaft is to transmit 250 kW power at 120 rpm. Find the diameter of the shaft if the shear stress is not to exceed 45 MPa. Also determine the percentage saving in weight if the shaft is replaced by a hollow shaft with internal diameter is 0.7 times the external diameter. [16]

3. A hollow circular section mild steel column, 6.0 m long with both ends hinged has to carry an axial load of 350 kN. Determine the dimensions of the section, using a factor of safety of 4. Adopt the internal diameter is 0.75 times the external diameter. Assume the Rankine's constants are $f_c = 315\ MPa$ and $\alpha = \frac{1}{7500}$. [16]

4. A pin-ended steel strut of length 4.5 m with uniform flexural rigidity is subjected to an axial force of 100 kN and a lateral concentrated force of magnitude 80 kN acting at the span centre. Determine the maximum bending moment and also find the maximum stress due to the given loading. Assume the moment of inertia of the cross-section is $6 \times 10^6 mm^4$. [16]

5. A rectangular column of size 750 mm × 750 mm is subjected to load of 1000 kN at an eccentricity of 100 mm and 50 mm with respect to major and minor centroidal axes respectively. Determine the stresses at the corners of the column. [16]

6. A simply supported beam of angle section 150 mm × 75 mm × 12 mm, with shorter leg horizontal is subjected to a bending moment of 10 kNm acting in the vertical plane through the centroid of the section. Find the maximum bending stresses induced in the section. [16]

7. A circular beam of radius 5 m and uniform cross-section is supported on 6 columns. The beam is subjected to an uniformly distributed load of intensity 25 kN/ m. Determine the position and magnitude of maximum torsional moment. [16]

8. Using the method of sections, determine the forces in the members 1,2,3 and 4 of a plane truss supported and loaded as shown in figure 8. [16]

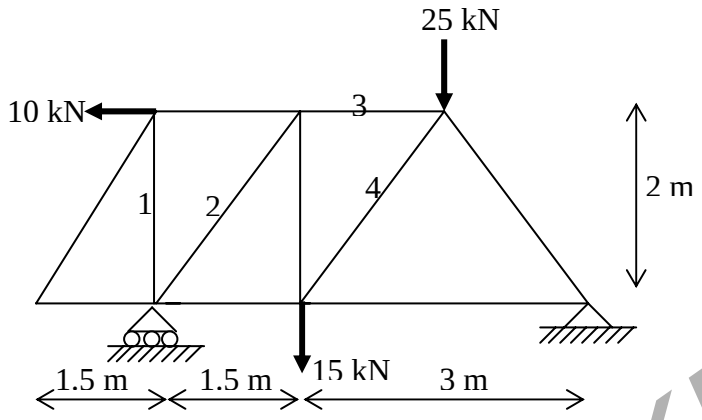


Figure 8

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Code.No: 07A40102 | R07 | SET-2

**II B.TECH – II SEM EXAMINATIONS, DECEMBER - 2010**
**STRENGTH OF MATERIALS – II**
**(CIVIL ENGINEERING)**

**Time: 3hours** **Max.Marks:80**

**Answer any FIVE questions**
**All questions carry equal marks**
- - -

1. The state of stress at a point of a loaded member is shown in figure 1, determine
   i) The magnitude and the direction of principal stresses
   ii) The magnitude of the maximum shear stress
   iii) The stresses acting on a plane $\Theta = 25^0$ with respect to vertical. [16]

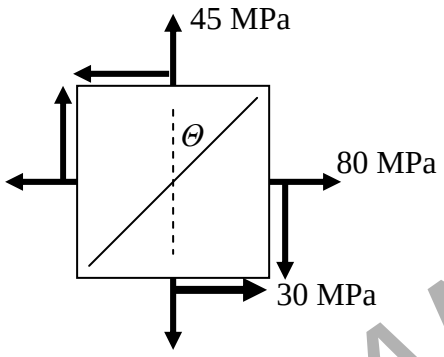


Figure 1

2. A circular shaft of 150 mm diameter is subjected to a bending moment of 50 kNm and a twisting moment of 30 kNm. Determine the location and the magnitude of maximum stress induced. [16]

3. Calculate the Euler's buckling load for a strut having T-section, with the dimensions: flange: 80 mm × 8 mm, thickness of the web 8 mm and depth of the section is 80 mm. The strut is 3.3 m long and hinged at both ends. [16]

4. A steel strut of length 6 m, both ends hinged, is subjected to an axial force of 75 kN and a uniformly distributed lateral force of magnitude 15 kN/m. Determine the maximum bending moment and also find the maximum stress due to the given loading. Assume the moment of inertia of the cross-section is $4.5 \times 10^6 mm^4$. [16]

5. A square masonry chimney of uniform section 45 m high has inside opening 1.25 m × 1.25 m. Find the required thickness at the base if the maximum permissible stress is limited to 1.0 MPa. Asssume the horizontal wind pressure is 1.5 $kN/m^2$ and the unit weight of masonry is 20 $kN/m^3$. [16]

6. A beam of rectangular section 100 mm × 200 mm deep is subjected to a bending moment of 20 kNm in a plane perpendicular to one of the diagonals. Determine the location of the neutral axis and the maximum bending stresses induced in the section. [16]

7. A semi-circular beam simply supported on three equally spaced supports. The beam carries uniformly distributed load of intensity 25 kN/ m of circular length. Draw the bending moment diagram and indicate the salient features. [16]

8. Using the method of sections, determine the forces in the members 1,2,3 and 4 of a plane truss supported and loaded as shown in figure 8. [16]

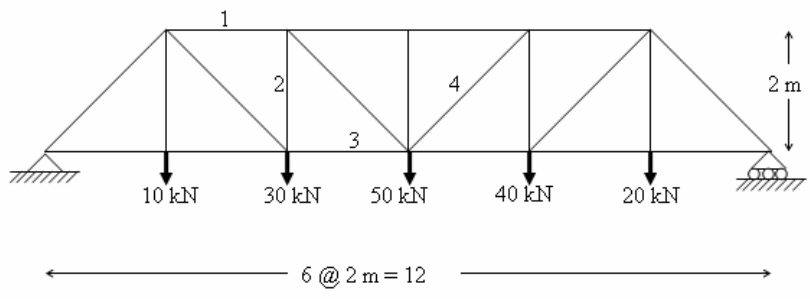


Figure 8

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Code.No: 07A40102 | R07 | SET-3

**II B.TECH – II SEM EXAMINATIONS, DECEMBER - 2010**
**STRENGTH OF MATERIALS – II**
**(CIVIL ENGINEERING)**

**Time: 3hours** **Max.Marks:80**

**Answer any FIVE questions**
**All questions carry equal marks**
- - -

1. For the state of stress shown in figure 1, using the Mohr's circle, determine
i) The plane of action and the magnitude of principal stresses,
ii) Maximum shear stress and
iii) The normal and shear stresses acting on a plane making an angle $25^0$ in the anti-clockwise direction with respect to x-axis. [16]

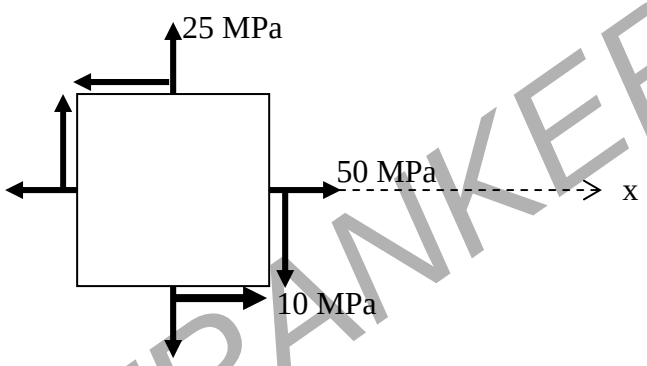

Figure 1

2. A hollow shaft is to transmit 200 kW power at 60 rpm. The internal diameter is 0.6 times the external diameter and the shear stress in the material of the shaft is not to exceed 45 MPa. Determine the dimensions of the shaft if the maximum torque is 1.5 times the mean. [16]

3. A steel built-up column consists of two channels (width of the flange = 75 mm, thickness of the flange = 9 mm, thickness of web = 6 mm and the depth of the section 150 mm) 100 mm apart back-to-back with two 250 mm × 8 mm plates on each flange. Calculate the permissible load with an eccentricity of 50 mm from the minor axis. Assume the maximum permissible stress is limited to 100 MPa. [16]

4. A steel strut of length 6 m, both ends fixed, is subjected to an axial force of 100 kN and two lateral concentrated forces of magnitude 50 kN each acting at 2m from the supports. Determine the bending moment at the ends and also find the maximum stress due to the given loading. Assume the moment of inertia of the cross-section is $12 \times 10^6\ mm^4$. [16]

5. A rectangular column of size 800 mm × 600 mm is subjected to load of 1000 kN at an eccentricity of 75 mm and 50 mm with respect to major and minor centroidal axes respectively. Determine the stresses at the corners of the column. [16]

6. A simply supported beam of angle section 200 mm × 100 mm × 12 mm, with longer leg vertical is subjected to a bending moment of 25 kNm acting in the vertical plane through the centroid of the section. Find the maximum bending stresses induced in the section. [16]

7. A circular beam of radius 4 m and uniform cross-section is supported on 6 columns. The beam is subjected to uniformly distributed load of intensity 35 kN/ m. Determine the position and magnitude of maximum bending moment. [16]

8. Analyse the cantilever plane truss supported and loaded as shown in figure 8. [16]

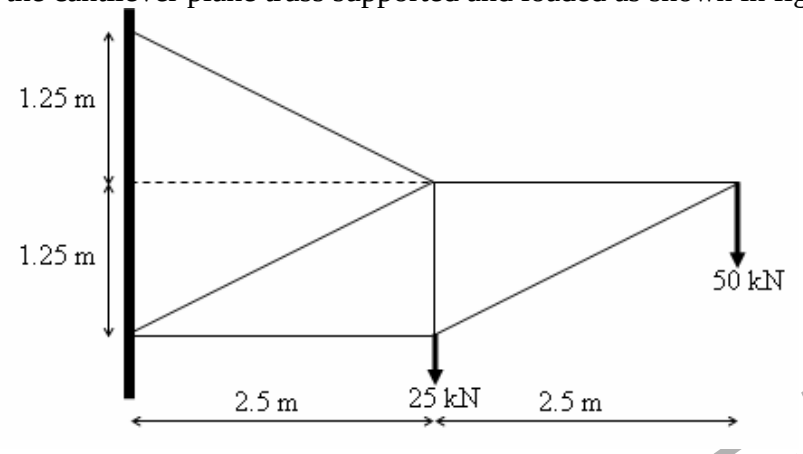


Figure 8

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Code.No: 07A40102 | R07 | SET-4

**II B.TECH – II SEM EXAMINATIONS, DECEMBER - 2010**
**STRENGTH OF MATERIALS – II**
**(CIVIL ENGINEERING)**

**Time: 3hours** **Max.Marks:80**

**Answer any FIVE questions**
**All questions carry equal marks**
- - -

1. The state of stress at a point of a member is shown in figure 1, determine
i) The plane of action and the magnitude of principal stresses,
ii) The maximum shear stress and its location and
iii) The normal and shear stresses acting on a plane making an angle $53^0$ in the clockwise direction with respect to x-axis. [16]

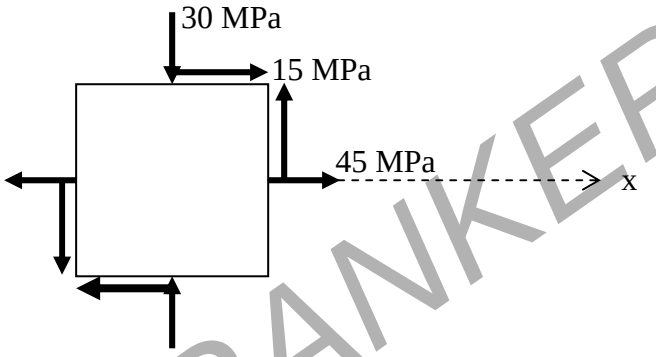



Figure 1

2. A open coiled helical spring is made of *16* mm steel rod coiled to a mean radius of *125 mm*. If the number of coils is *10* and the angle of helix is $26^0$. Calculate the deflection under the axial load of 250 *N* and also determine the maximum direct and shear stresses induced in the section of the wire. [16]

3. A hollow circular C.I. column 175 mm external diameter and 22.5 mm thick is hinged at both ends. For what length of the column will the Euler's formula and Rankin's formula give the same crushing load? Adopt $E$ = 8000 kN/m$^2$, $f_c$ =550 kN/m$^2$, and $\alpha = \frac{1}{1600}$. [16]

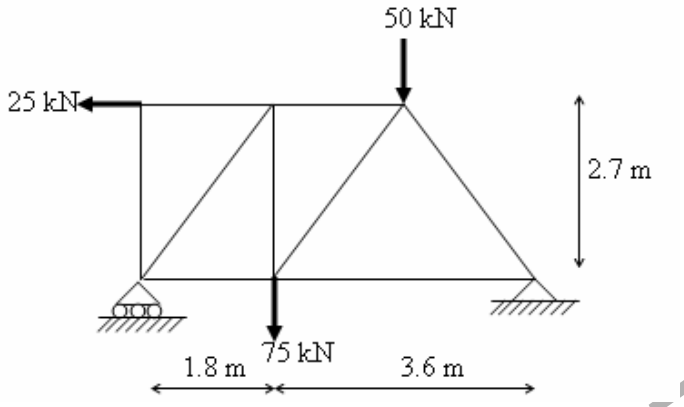
4. A steel strut of length 5.4 m, both ends fixed, is subjected to an axial force of 125 kN and a lateral concentrated force of magnitude 100 kN acting at acting at the mid-span. Determine the bending moment at the ends and also find the maximum stress due to the given loading. Assume the moment of inertia of the cross-section is $9 \times 10^6$mm$^4$. [16]

5. A chimney 50 m high with external diameter tapers from 3.5 m at the base to 2.0 m at the top. The internal diameter at the base is 2.5 m. The horizontal wind pressure is 1500*N/m*$^2$. Self-weight of the chimney is 2*MN*. Determine the maximum and the minimum stresses. [16]

6. A beam of rectangular section 150 mm × 250 mm deep is subjected to a bending moment of 25 kNm in a plane making an angle $45^0$ with respect to minor centroidal axis. Determine the location of the neutral axis and the maximum bending stresses induced in the section. [16]

7. A semi-circular beam simply supported on three equally spaced supports. The beam carries uniformly distributed load of intensity 20 kN/ m of circular length. Draw the torsional moment diagram and indicate the location and magnitude of maximum torsional moment. [16]

8. Analyze the plane truss supported and loaded as shown in figure 8. [16]




Figure

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