Code No: RT22013 **R13** SET - 1

II B. Tech II Semester Regular Examinations, April/May - 2016
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Write about Principal stress theory
   b) Explain the Theory of pure torsion?
   c) What the different types of columns?
   d) Write the stresses in dams?
   e) What is moment of inertia?
   f) Write a note on method of joint?

PART -B

2. a) Write a note on Mohr's circle of stresses. What is the importance of this circle?
   b) A rectangular block of 1200 mm^2 cross-sectional area is subjected to a longitudinal compressive load of 1200kN. Determine the normal stress across the cross section of the block. If the block is cut by an oblique plane making an angle of 40^0 with normal section of the block. Determine:
      (i) Normal stress on the oblique plane
      (ii) Tangential stress along the oblique plane, and
      (iii) Resultant stress on the oblique plane.

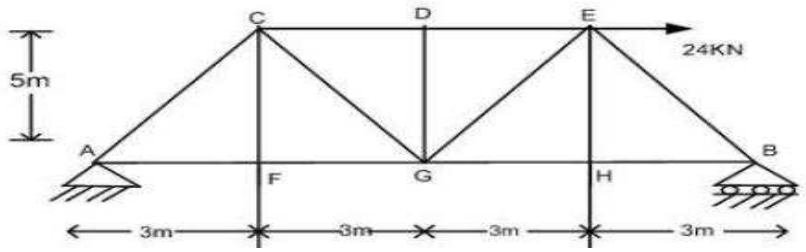
3. The external diameters of a steel collar are 200mm, and the internal diameter decreases by 0.125mm when shrunk on to a solid steel shaft of 125mm diameter. Find the reduction in diameter of the shaft, the radial pressure between the collar and the shaft and hoop stress at the inner surface of the tube. Take E = 210GN/m^2 and 1/m=0.3.

4. Starting from secant formula, derive Perry's formula for long columns

5. a) Explain briefly how stresses in beams due to un symmetric bending is considered.
   b) Explain briefly the method of locating shear centre.

6. Determine of stresses in the case of chimneys, retaining walls

7. Determine the forces in all the members of the frame by method of joints



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Code No: RT22013 **R13** SET - 2

II B. Tech II Semester Regular Examinations, April/May - 2016
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) What are the different Theories of Failures?
   b) Write about close and open coiled helical springs
   c) What is the difference between short and long column?
   d) Write the stresses in retaining walls?
   e) What is the difference between symmetrical and unsymmetrical bending?
   f) Explain the concept of indeterminate trusses

PART -B

2. a) Explain the terms principal stresses and principal planes.
   b) Derive expressions for principal stresses, principal planes and max shear stress if there are like direct stresses accompanied by a state of simple shear.

3. a) Define helical spring? Name the two important types of helical springs.
   b) A hollow shaft of diameter ratio 3/5 is required to transmit 400KW at 140 r.p.m with a uniform twisting moment. The shear stress in the shaft must not exceed 60 MPa and the twist in a length 2.5 m must not exceed 1^0. Calculate the minimum external diameter of the shaft. Take $C=8X10^4$ MPa.

4. a) Derive the Rankine's formula for crippling load.
   b) A column of circular section has 160mm diameter and 4m length. Both ends of the column are fixed. The column carries a load of 150kN at an eccentricity of 15mm from the geometrical axis of the column. Find the maximum compressive stress on the column section.

5. Distinguish between direct stress and bending stress by means of a diagram.

6. a) What do you mean by unsymmetrical bending?
   b) Locate the shear centre of the section shown in Figure 1. Thickness is 6mm throughout.

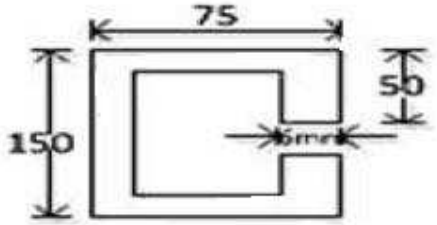

Figure 1

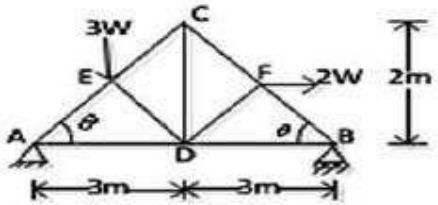

Figure 2

7. Calculate the magnitude and nature of the forces in the member of the truss as shown is Figure 2, by method of joints.

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Code No: RT22013 **R13** SET - 3

II B. Tech II Semester Regular Examinations, April/May - 2016
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Explain about Mohr's circle?
   b) Write the different Types of springs?
   c) What is slenderness ratio
   d) Write about bending stresses?
   e) Explain briefly about unsymmetrical bending?
   f) Explain the concept of determinate trusses

PART -B

2. a) Derive an expression for the normal stress and shear stress on an oblique section of a rectangular body when it is subjected to direct stress in one plane only.
   b) A rectangular element is a strained body is subjected to tensile stresses of 250 N/mm^2 and 180 N/mm^2 on mutually perpendicular planes together with a shear stress of 80N/mm^2. Determine:
   i) Principal stresses ii) Principal planes
   iii) Maximum shear stress and iv) Plane of maximum shear stress

3. A closely coiled helical spring is made out of 10mm dia. steel rod, the coil having 12 complete turns. The mean dia. of spring is 10mm. Calculate the shear stress induced in the section of the rod due to an axial load of 250N. Find also the deflection under the load, energy stored in the spring and the stiffness of spring. Take N = 8 x10^4 *N/mm*^{2}.

4. a) Deduce a formula for the critical load of a column having both ends hinged.
   b) A solid circular bar 6m long and 5 cm in diameter was found to extend 4.5 mm under a tensile load of 50KN. The bar is used as a strut with both ends hinged. Determine the buckling load for the bar and the safe load, consider factor of safety as 3.0.

5. Determine of stresses in the case of dams and explain the conditions for stability?

6. A beam of rectangular section 100mm wide and 180mm deep is subjected to a bending moment of 12kN.m The trace of the plane of loading is inclined at 45^0 to the y-y axis of the section. Locate the natural axis of the section and calculate the maximum bending stress induced is the section.

7. Find the forces in the members of truss by method of joints as shown in Figure 1.

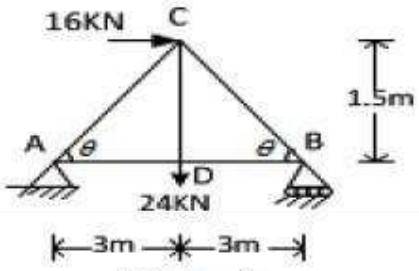

Figure 1
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Code No: RT22013 **R13** SET - 4

II B. Tech II Semester Regular Examinations, April/May - 2016
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Explain about Normal and tangential stresses on an inclined plane
   b) Write about Polar section modulus with one example?
   c) Write the Limitations of Euler's theory
   d) Write the stresses in chimneys
   e) Explain about centroid in rectangular section
   f) Write a short nore on method of section?

PART -B

2. a) Briefly illustrate the shear strain energy theory.
   b) Using the above theory estimate the factor of safety for a certain type of steel whose Proportional limit is 280 MPa. The principal stresses were found to be 100 MPa (tensile),60 MPa (tensile) and 30 MPa (compressive)

3. Design a close coiled helical spring made of by steel wire. The diameter of the coil is 10 times the diameter of the wire. A load 650N is applied on the spring which causes a deflection of 60mm. Take allowable maximum shear stress is 80N/mm^2 and C=8X10^4 N/mm^2.

4. a) Define slenderness ratio of a column. What is its importance?
   b) A column of circular section has 160mm diameter and 4m length. Both ends of the column are fixed. The column carries a load of 150kN at an eccentricity of 15mm from the geometrical axis of the column. Find the maximum compressive stress on the column section.

5. A square chimney 25m high, having an opening of l*n* by l*n* is subjected to a horizontal wind pressure of 1.5 KN/m^2. Find the necessary thickness of brick work at base if the density of the masonry is 21 KN/m^3 and the max permissible stress on brick masonry is limited to 0.8N/mm^2.

6. a) What do you mean by unsymmetrical bending?
   b) A beam of rectangular section 80mm wide and 120mm deep is subjected to a bending moment of 12kN.m The trace of the plane of loading is inclined at 45^0 to the y-y axis of the section. Locate the natural axis of the section and calculate the maximum bending stress induced is the section

7. Find the forces in the members of truss by method of section as shown in Fig 1.

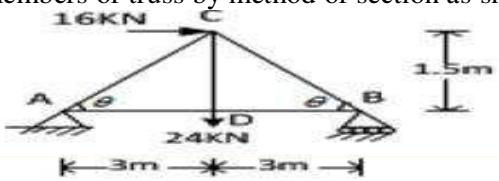

Fig-1

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Code No: RT22013 **R13** SET - 1

II B. Tech II Semester Regular Examinations, May/June - 2015
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) If the principal stresses at a point in an elastic material are 2f tensile, 1.5f tensile and f compressive, calculate the value of 'f' at failure according to the maximum principal strain theory. The elastic limit in simple tension is 210 N/mm^2 and Poisson's ratio is 0.30.
   b) A 450 kW of power has to transmit at 100 r.p.m. Find the suitable diameter of hollow circular section, the inside diameter being 3/4 of the external diameter. Take allowable shear stress as 70 N/mm^2.
   c) Write and explain about the limitations of Euler's Formula.
   d) Find core diameter of a solid section, if diameter is 'd'.
   e) Explain the concept of unsymmetrical bending. What are the conditions that should be satisfied for a beam to bend without twisting?
   f) Explain the procedure for tension coefficient method in statically determinate frame.

(4M+4M+3M+4M+4M+3M)

PART-B

2. Direct stresses of 120 N/mm^2 (tensile) and 90 N/mm^2 (compressive) exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2.
   i) What must be the magnitude of the shearing stresses on the two planes?
   ii) What will be the maximum shearing stress at the point?

3. a) Derive the torsion equation from fundamentals $T/J = q/r = N\theta/L$ with usual notation.
   b) A solid steel shaft has to transmit 75 kW at 200 r.p.m., taking allowable shear stress as 70 N/mm^2. Find the diameter for the shaft, if maximum torque transmitted at each revolution exceeds the mean by 30%.
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4. A hollow rectangular column of external depth 1 m and external width 1 m is 10 cm thick. Calculate the maximum and minimum stress in the section of the column, if vertical load of 200 kN is acting with an eccentricity of 20 cm.

5. A beam carries a UDL of 50 kN/m over a span of 2 m long, with an axial compressive load of 50 kN. The beam section is rectangular, having depth equal to 240 mm and width equal to 120 mm. Compute (i) maximum fibre stress, (ii) fibre stress at a point 0.5 m from the left end of the beam and 80 mm below the N.A.

6. A beam of rectangular section, 80 mm wide and 10 mm deep is subjected a bending moment of 12 kN-m. The trace of the plane of loading is included at 45° to the Y-Y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section.

7. A cantilever truss is loaded as shown in Figure 1. Analyze the truss by method of sections.

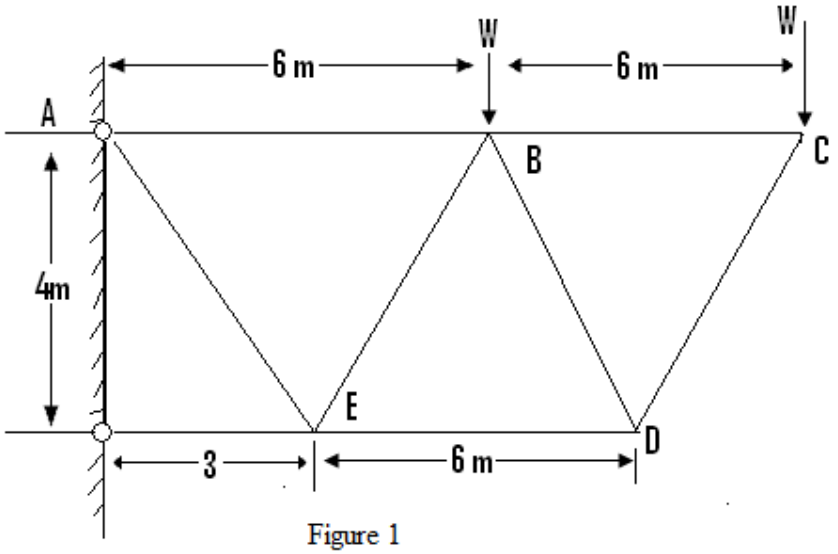

Figure 1

Code No: RT22013 **R13** SET - 2

II B. Tech II Semester Regular Examinations, May/June - 2015
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) In a piece of material, a tensile stresses p1 and a shearing q act on a given plane. Show that principal stresses are always of opposite sign.
   b) Write the assumptions made in the theory of torsion.
   c) Calculate Euler's critical stress for the column having slenderness ratio 100,150 with both ends hinged. Take E = $2x10^5$ N/mm^2.
   d) Find core diameter of a hollow section, if external and internal diameter are 'D' and 'd'.
   f) State the assumptions made in analyzing a beam for unsymmetrical bending.
   g) Explain the procedure for method of sections in statically determinate frame.

(4M+3M+4M+4M+3M+4M)

PART-B

2. A circular shaft 100 mm diameter is subjected to combined bending and twisting of moments the B.M being 3 times the twisting moment. If the direct tensile yield point of the material is 350 N/mm^2, and the factor of safety is 4, calculate the allowable twisting moment according to the following theories of failures. (i). maximum principle stress theory, (ii) shear strain energy theory, if the simple shear is not to exceed 60 N/mm^2.

3. Derive the maximum shear stress induced, in the wire of a closed-coiled helical spring which carries an axial load W. Assume mean radius of spring coil is R and diameter of spring wire is d.

4. In an experimental determination of the buckling load for a rod 12 mm mild steel pin ended struts of various lengths, two of the values obtained were: (a) When the length is 50 cm load is 10 kN and (b) When the length is 20 cm load is 30 kN.
   Make necessary calculations and state whether either of the values of the loads, confirm with Euler's formula for the critical load. Take E= $2x10^5$ N/mm^2.

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5. A hollow rectangular column of external depth 1 m and external width 1 m is 10 cm thick. Calculate the maximum and minimum stress in the section of the column if vertical load of 200 kN is acting with an eccentricity of 20 cm.

6. Determine the principal moments of Inertia for an angle section 225x175x15 mm.

7. A cantilever truss is loaded as shown in Figure 1. Analyze the truss by method of joints.

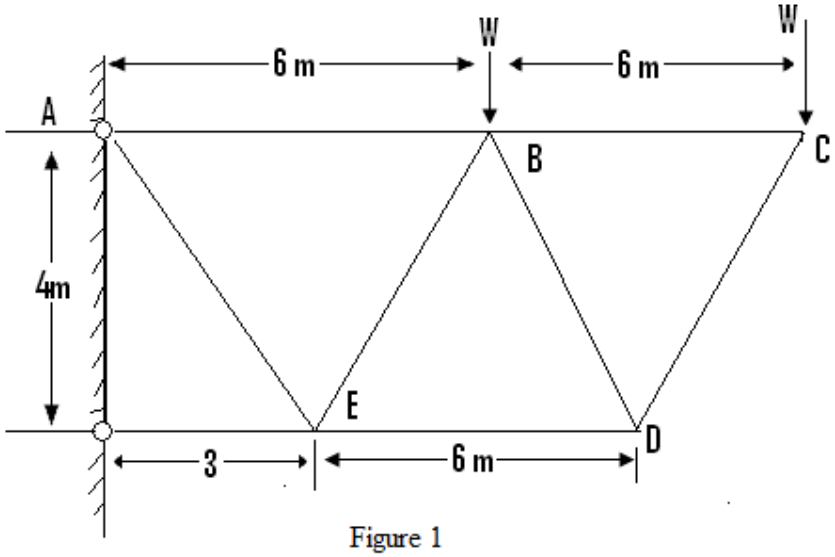

Figure 1

Code No: RT22013 **R13** SET - 3

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STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Show that the greatest shear strain is equal to greatest difference of principal strains.
   b) Find the maximum torque that can be safely applied to a shaft of 200 mm diameter, if the permissible shear stress is 45 N/mm^2.
   c) An I-section joist ISWB400 and 8 m long is used as a strut with both ends fixed, determine Euler's crippling load. Give for the section Ixx = 23426.7 cm^4, Iyy= 1388.0 cm^4 and E = $2x10^5$ N/mm^2.
   d) Find maximum eccentricity of the rectangular section (width b and depth d) for no tension in the section.
   f) Explain the concept of unsymmetrical bending. What are the conditions that should be satisfied for a beam to bend without twisting?
   g) Determine the forces in the members of equilateral triangle truss of span 'L' loaded with a point load 'W'. (4M+3M+4M+4M+4M+3M)

PART-B

2. An element is subjected to tensile stresses of 60 N/mm^2 and 20 N/mm^2 acting on two perpendicular planes and is also accompanied by shear stress of 20 N/mm^2 on these planes. Draw the Mohr's circle of stresses and determine the magnitudes and directions of principal stresses and also the greatest shear stress.

3. A leaf spring carries a central load of 3000 N. The leaf spring has to be made of 10 steel plates 5 cm wide and 6 mm thick. If the bending stress is limited to 150 N/mm^2 determine: (i) length of the spring and (ii) deflection at the centre of the spring. Take E = $2x10^5$ N/mm^2.

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4. a) Derive Euler's buckling load formula of a long column pinned at both ends.
   b) A solid round bar 3 m long and 5 cm in diameter is used as a strut with one end is fixed and other is hinged. Determine the crippling load. Take E = $2x10^5$ N/mm^2.

5. A short column of external diameter 40 cm and internal diameter 20 cm carries an eccentric load of 80 kN. Find the greatest eccentricity which the load can have without producing tension on the cross –section.

6. A rectangular section of dimensions 120 x 200 mm is used as a beam on a 3 m span, If the beam is loaded by a concentrated load (P) at the centre at 30^o to the vertical (Y-Y axis). Find the maximum value of the load 'P' in kN, if the maximum bending stress is not to exceed 12 MPa.

7. Determine the member forces of the truss shown in Figure 1, using method of joints.

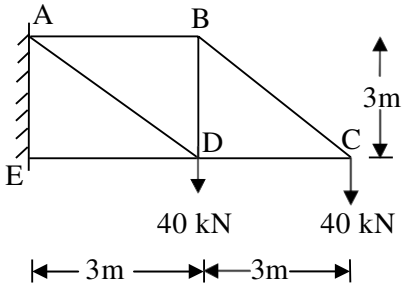

Figure 1

Code No: RT22013 **R13** SET - 4

II B. Tech II Semester Regular Examinations, May/June - 2015
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Discuss briefly the maximum principal stress theory.
   b) A solid shaft is required to transmit 120 kW power at 200 r.p.m. Find the suitable diameter of the shaft if maximum torque transmitted in each revelation exceeds the mean by 20%. Take allowable shear stress as 70 N/mm^2.
   c) Calculate Euler's critical stress for the column having slenderness ratio 150, 200 with both ends fixed. Take E = $2x10^5$ N/mm^2.
   d) Explain about the term kernel and determine the size of kernel for a rectangular 200 mm x 300 mm.
   f) State the assumptions made in analyzing a beam for unsymmetrical bending.
   g) Explain the procedure for tension coefficient method in statically determinate frame.

(4M+4M+3M+4M+3M+4M)

PART-B

2. Derive an expression for the major and minor principal stresses on an oblique plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress

3. a) Derive the maximum shear stress induced, in the wire of a closed-coiled helical spring which carries an axial load W. Assume mean radius of spring coil is R and diameter of spring wire is d.
   b) A leaf spring carries a central load of 3000 N. The leaf spring has to be made of 10 steel plates 5 cm wide and 6 mm thick, if the bending stress is limited to 150 N/mm^2. Determine: (i) length of the spring and (ii) deflection at the centre of the spring. Take E = $2x10^5$ N/mm^2.
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4. A 1.5 m long column has a circular cross section of 5 cm diameter, one of the ends of the column is fixed in direction and position, and the other end is free. Taking factory of safety as 3, calculate the safe load using: (i) Rankin's formula, take yield stress is 560 N/mm^2 and a= 1/1600 for pinned ends, (ii) Euler's formula, Young's Modulus for the material is $1.2x10^5$ N/mm^2.

5. A square chimney, 30 m high, has a flue opening of size 1.5 m x 1.5 m. Find the minimum width required at the base for no tension if the masonry weights 20 kN/m^3 and the wind pressure is 1.5 kN/m^2. The permissible stress in the masonry is 1kN/m^2.

6. A T-Section of dimensions 150 wide x 200 mm deep, with 10 mm thickness of flange and web, is used as simply supported a beam on a span of 6 m. Find the maximum value of 'w' in kN/m, the permissible stress in the material is 120 MPa. The plane of loading is inclined at an angle of 40^o to the vertical plane.

7. Determine the member forces of the truss shown in Figure 1, using method of sections.

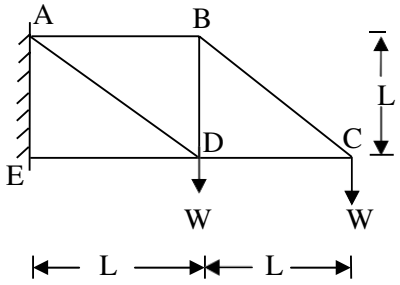

Figure 1