CIVIL DEPARTMENT

MECHANICS OF STRUCTURES- ASSIGNMENT NO 1

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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1) Determine moment of Inertia about the centroidal axes X-X and Y-Y of an Unsymmetrical

I section with following details.

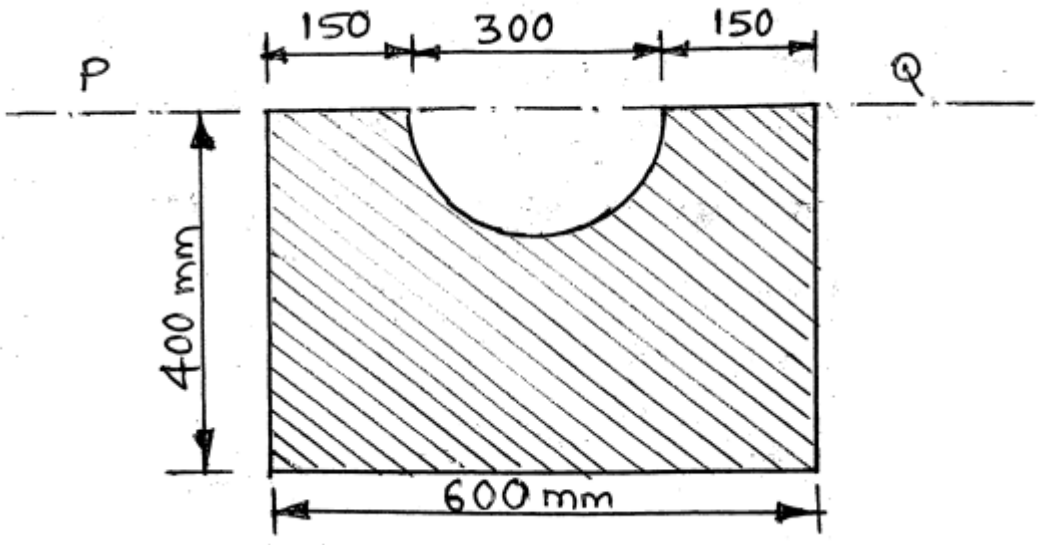
Top flange – 100 mm × 20 mm

Bottom flange – 180 mm × 20 mm

Web – 80 mm × 20 mm.

2) Find moment of Inertia about the diagonal of a square section having diagonal 400 mm.

3) Determine moment of inertia of shaded area as shown in Figure about horizontal axis PQ.



4) Calculate IXX for the T-section having flange 250 × 20 mm and web 20 × 250 mm overall depth is 240 mm.

5) Calculate the radius of gyration of a steel pipe having external diameter 26 mm and internal diameter 10 mm.

6) A hollow circular section of external diameter 200 mm has a uniform thickness of 20 mm, calculate its moment of inertia with respect to

i) Diameter

ii) Tangent to the bottom of circle

iii) The axis parallel to and 20 mm below the tangent.

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MECHANICS OF STRUCTURES - ASSIGNMENT NO 2

Brach: CE **YEAR: 2018-2019**

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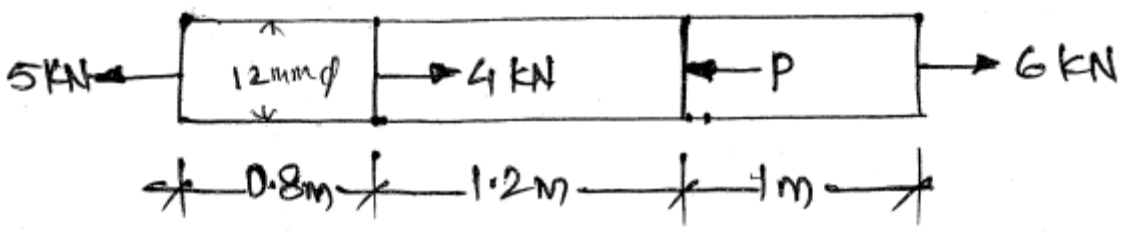
1) Draw stress-strain curve for a ductile material showing important points.

2) Determine load P and total elongation in the bar shown in Figure having 13 mm diameter E = $2 \times 10^5 N/mm^2$



3) A reinforced concrete column is 300 mm × 300 mm in section, reinforced with 8 bars of 20 mm dia. The column carries a load of 360 KN find the stresses in concrete and steel bars. Take $E_S = 2.1 \times 10^5 N/mm^2$ and $E_C = 1.4 \times 10^4 N/mm^2$.

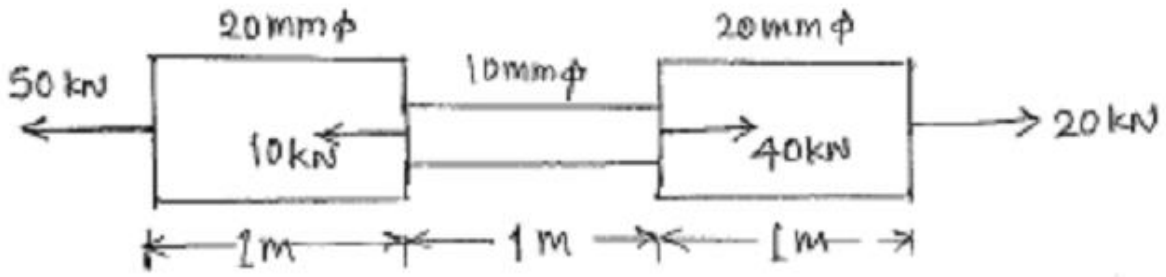
4) A steel tube with 60 mm inside diameter and 5 mm thickness is filled with concrete. Determine load shared by each material due to axial thrust of 80 KN Take $E_S = 210 \times 10^3 N/mm^2$ $E_C = 14 \times 10^3 N/mm^2$.

5) State meaning of punching shear stress.

6) A RCC column 500 mm × 500 mm is reinforced with 4 bars of 20 mm diameter. Determine the stresses induced in steel and concrete. If it is subjected to an axial load of 600 KN and modular ratio is 13.

7) Determine the total elongation of the bar shown in figure.

Take E = 2×10^5 N/mm^2.



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MECHANICS OF STRUCTURES -ASSIGNMENT NO 3

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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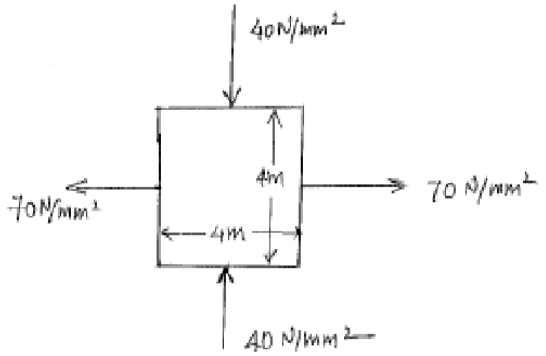
1) Define resilience and modulus of resilience.

2) A bar of cross section 30 mm × 60 mm and length 600 mm is subjected to axial tensile force of 60 kN The change in length is 0.20 mm. Determine change in depth and change in width and change in volume of bar. Take μ= 0.30 and

$E = 2\times10^5 N/mm^2$.

3) In a biaxial stress system as shown in figure, the stresses along the two perpendicular directions. Calculate the strains along these two directions.

Take $E= 2.1 \times 10^5 N/mm^2$ and μ= 0.28. Also find change in length in both direction if section is square of 4 m.



4) A cube of 200 mm side is subjected to a compressive force of 3600 KN on all its faces. The change in the volume of cube is found to be 5000 mm^3. Calculate the Bulk modulus. If μ= 0.28, find the Young's modulus.

5) A metal rod 20 mm diameter and 2 m long when subjected to tensile force of 60 kN shows an elongation of 2 mm and reduction in diameter 0.006 mm. Calculate the modulus of elasticity and modulus of rigidity.

6) In a tension test on a certain specimen 20 mm diameter, 200 mm long an axial pull of 100 Kn produce an elongation 0.32 mm and reduction in diameter is observed to be 0.0085 mm. Findthe value of Poisson's ratio.

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MECHANICS OF STRUCTURES - ASSIGNMENT NO4

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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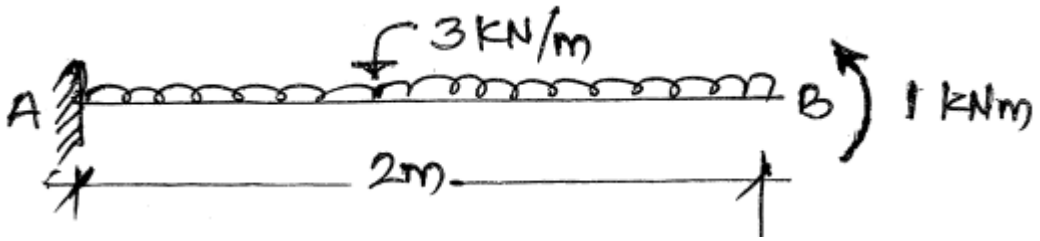
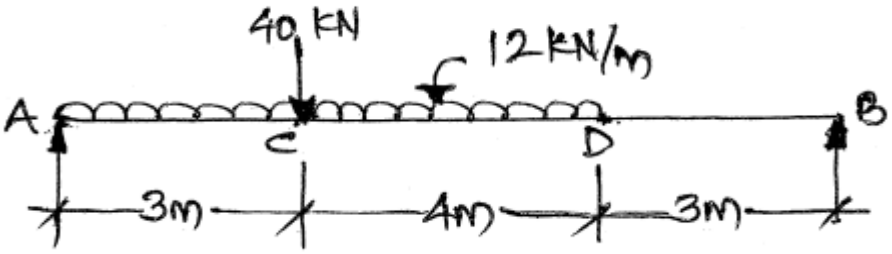
1) Draw SFD and BMD for the cantilever beam loaded as shown in Figure.



2) Draw SFD and BMD for the simply supported beam shown in Figure. Show all important values.

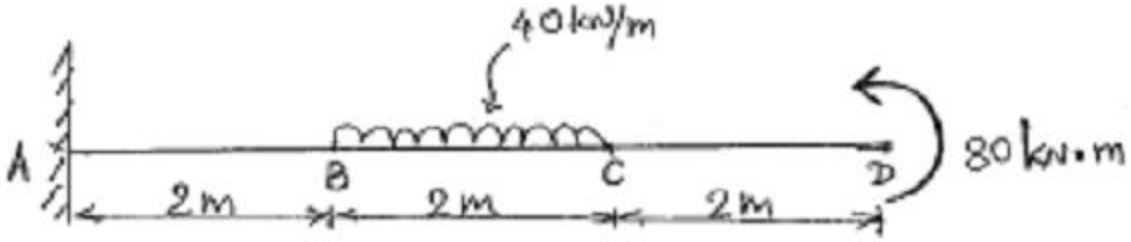


3) An overhanging beam ABC, such that AB = 4 m and BC = 1 m. It is supported at 'A' and 'B'. The beam ABC is subjected to UDL of 30kN/m over entire length, it is subjected to point load of 50 KN at the free end C. Draw SFD and BMD. Locate point of contra flexure if any.

4) A beam ABC supported at A and B such that BC as overhang. AB = 3 m, BC = 1 m, span AB carried UDL 10 kN/m and point load of 6 kN acts at point C. Draw shear force and bending moment diagrams. Also locate point of contra flexure, if any.

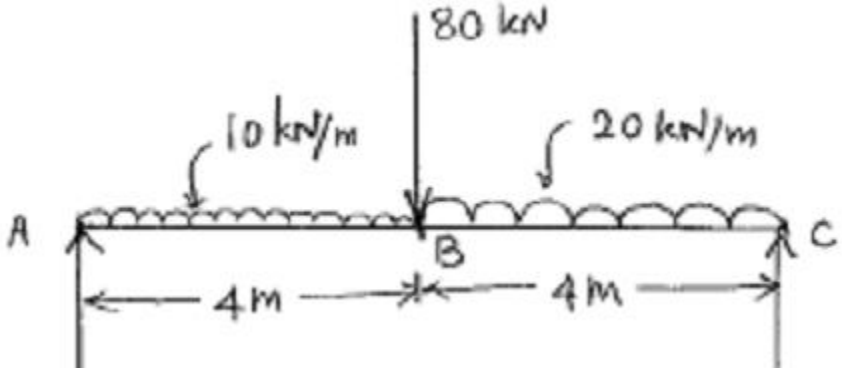
5) A simply supported beam of span ‘L’ carries central point load ‘W’. Draw SED and BMD

6) Draw SFD and BMD with calculations for the beam shown in figure.



7) State relation between shear force and rate of loading and also relation between shear force and bending moment.

8) Draw SFD and BMD with calculations for the beam shown in figure.



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MECHANICS OF STRUCTURES - ASSIGNMENT NO 5

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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1) A T section of flange 180 mm × 20 mm and web 180 × 20 mm is simply supported at the both ends. It carries two concentrated loads of 100 kN each acting 2 m distance from each support. Span of the beam is 8 m. Determine the maximum bending stress induced in the beam and draw bending stress distribution diagram and also find bending stress at the layer 100 mm from the bottom.

2) A beam has hollow rectangular section with external dimensions 90 mm × 160 mm and uniform thickness of section is 10 mm. Draw shear stress variation diagram. It section is subjected to the shear force 80 kN. Also determine ratio of maximum shear stress and average shear stress

3) A timber beam 160 mm wide and 300 mm deep is simply supported over a span of 4 m. It carries udl 15 kN/m over entire span. Find the maximum bending stress induced in the section. Draw bending stress distribution diagram. Also find radius of curvature if E = 1.6 kN/mm2

4) A T-section with flange 130 mm × 10 mm and web 10 mm × 130 mm is used as a simply supported beam with flange at top. If the permissible bending stress in tension and compression are 180 MPa and 120 MPa respectively, determine the moment of resistance. E = 210 GPa

5) A circular section of diameter 180 mm is subjected to a shear force 20 kN when used as a beam. Calculate average and maximum shear stress and draw shear stress distribution diagram

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MECHANICS OF STRUCTURES - ASSIGNMENT NO 6

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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1) A column having diameter 400 mm is 6 m long. Determine Euler's crippling load, if both ends of column are fixed. Take E = 2 × 105N/mm2

2) With a neat sketch show effective length of column for various end conditions. (min. four)

3) For applying Euler's formula, find the minimum value of slenderness ratio for mild steel strut with both ends fixed. Take yield stress as 315 MPa and E as

210 GPa

4) Compare the crippling loads given by Euler's and Rankine's formula for a strut with both ends hinged, 2.5 m long, 50 mm external and 30 mm internal diameters, Take E = 200 GPa,7500/1= α σ_c = 320 MPa

5) State assumptions made in Euler's theory of long columns

6)A Column having diameter 300mm is of length 3m both ends of the column are hinged Find Eulers crippling load Take E=2X10MPa

7) A column having diameter 300 mm and length 4 m. Both end of column is hinged. Find Euler's crippling land. Take E = 2 × 10 5MPa.

CIVIL DEPARTMENT

MECHANICS OF STRUCTURES - ASSIGNMENT NO 7

Brach: CE **YEAR: 2018-2019**

Div: B **SEMESTER: III**

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1) A bar 20 mm diameter is subjected to following cases. Determine strain energy stored and modulus of resilience in following case

i) A gradually applied load of 800 N stretches bar by 0.3 mm

ii) A impact load of 700 N is dropped by 80 mm on the collar attach at the lower end of the bar. Take E = 200 GPa.

2) Give an example of suddenly applied load. Also write equation for the stress developed due to suddenly applied load.

3) Define Resilience and modulus of resilienc

4) A weight of 2000 N falls on to a collar, at the lower end of the bar 7 m long, through a height of 300 mm. Determine the diameter of the bar if the stress induced is 90 MPa.Take E = 210 GPa.

5) Differentiate gradual load and sudden load. Write four points of difference.