Code No: A109210103 **R09** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
STRENGTH OF MATERIALS-I
Civil Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. A pressurized cylinder of 360 mm internal diameter and 3 mm wall thickness registered a pressure of 0.15 MPa when subjected to an axial compression of 63 kN. Determine the poisons ratio of the material. Assume E = 150 GPa for the cylinder and K = 2.5 GPa for the fluid. [15]

2. Find the elongation of a bar, length L and cross-sectional area A, under the action of its own weight. Assume the unit weight of the bar is w/unit length. [15]

3. (a) What are the advantages of compound cylinders? Explain analytically.
   (b) What are the advantages and disadvantages of shell structures? [15]

4. A beam of I - section 300 mm deep and 200 mm wide, has equal flanges 20 mm thick and web 12 mm thick. It carries, at a section a shear force of 250 kN. Draw the distribution of shear stress across the section and also calculate the total shear force carried by the web. [15]

5. A simply supported beam of span 7 m carries a uniformly distributed load of 25 kN/m run over the length of left half of its span, together with concentrated loads of 30 kN, 75 kN and 50 kN situated at 1.0m, 2.0m and 3.5 m respectively from right support. Draw the shear force and bending moment diagrams and find out the magnitude and position of the maximum bending moment. [15]

6. A beam of T-section, flange 150 mm × 25 mm, width of the web 25 mm and overall depth of the section 200 mm is simply supported over a span 4.5 m and is so arranged that the flange is uppermost. It carries a uniformly distributed load of 40 kN /m over its entire span. Find the maximum tensile and compressive stresses. [15]

7. Compute the maximum deflections and support rotations in the beams of the following figure 7 using
   (a) The methods of integration and
   (b) The method of moment area. [15]

8. At a point in strained material the principal stresses are 60 N/mm^2 and 0 N/mm^2. Find the position of plane across which the resultant stress is most inclined to the normal and determine the value of this stress. [15]

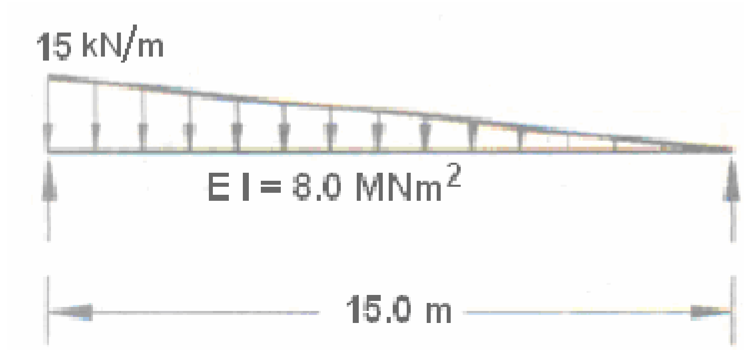

Figure 7

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Code No: A109210103 **R09** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
STRENGTH OF MATERIALS-I
Civil Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) State the assumptions made in the theory of pure bending.
   (b) Derive the flexure formula from first principle. [15]

2. Determine the elongation of a conical bar, length L and diameter at base D, under the action of its own weight, assume the density of the material is ρ. [15]

3. At a point a beam section there is a longitudinal bending stress of 120 N/mm^2 tensile and a transverse shear stress of 50 N/mm^2. Find the resultant stress on a plane inclined at 30^0 to the longitudinal axis. [15]

4. Design a cylinder of 800 mm diameter to sustain an internal pressure of 36 MPa assuming a permissible stress of 200 MPa and Poisson's ratio of 0.20. [15]

5. (a) Determine the length of overhang of the beam shown in figure 5, such that the displacement at D is zero.
   (b) State Moment Area theorems. [15]

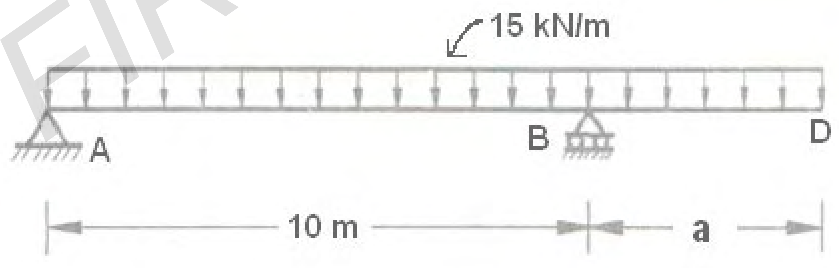

Figure 5

6. Draw the shear force and bending moment diagrams for a beam supported of span 6 m loaded as shown in figure 6. Also find and show the magnitude of maximum bending moment. [15]

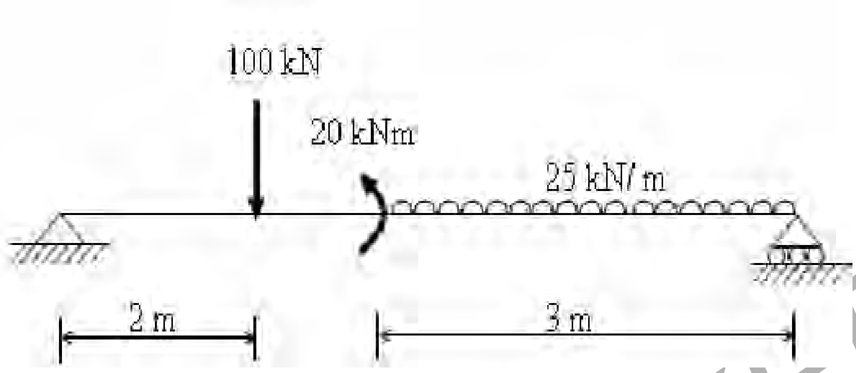

Figure 6

7. A beam has a cross-sectional area in the form of an isosceles triangle having the dimensions base 100 mm and height h 200 mm. The cross-section of the beam is subjected to a vertical shear force of 125 kN. Draw the variation of the shear stress distribution across the section. [15]

8. A cylinder of 200 mm diameter and 25 mm thickness is subjected to an internal pressure of 63 MPa. Determine the stress distribution and compare with thin cylinder theory. Find the change in the thickness of the cylinder for $\nu = 0.22$ and E = 210 GPa. [15]

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Code No: A109210103 **R09** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
STRENGTH OF MATERIALS-I
Civil Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. The volume of a hollow cylinder of 800 mm diameter, 1.4 m length and 10 mm thickness increases by 1245 ml when subjected to an internal pressure of 4.5 MPa. Determine the Poissons ratio of the material, if E = 190.0 GPa. [15]

2. (a) At a point the principal stresses are 140 N/mm^2 and 75 N/mm^2 both tensile. Find the normal and tangential stresses on a plane inclined at 60^0 to the axis of the major principal stress.
   (b) The principal stresses at a certain point in strained material are 150 N/mm^2 and 48 N/mm^2 both tensile. Find the normal and tangential stresses on a plane inclined at 20^0 with the major principal plane. [15]

3. (a) Define Poission's ratio.
   (b) Determine the volumetric strain of a rectangular bar of length L, width b and depth d subjected to an axial load P from first principle. [15]

4. A steel H - beam section shown in figure 4, thickness 20 mm, is subjected to a shear force of 250 kN. Draw the shear stress distribution across the depth of the section. Also determine ratio of maximum shear stress to the mean shear stress. [15]

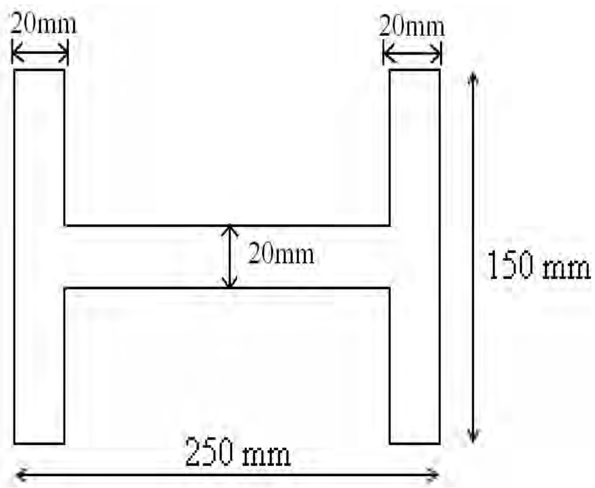

Figure 4:

5. A beam of I - section 250 mm × 125 mm has flanges 12.5 mm thick and web 6.9 mm thick. Compare its flexural strength with that of a beam of rectangular section of same weight, the depth being twice the width. [15]

6. The maximum allowable stress in a cylinder of 500 mm inner diameter and 100.0 mm thickness is 12.6 MPa. Determine the maximum allowable internal and external pressures on the cylinder, when applied separately. [15]

7. Draw the shear force and bending moment diagrams for a beam supported and loaded as shown in figure 7. Locate the salient points. [15]

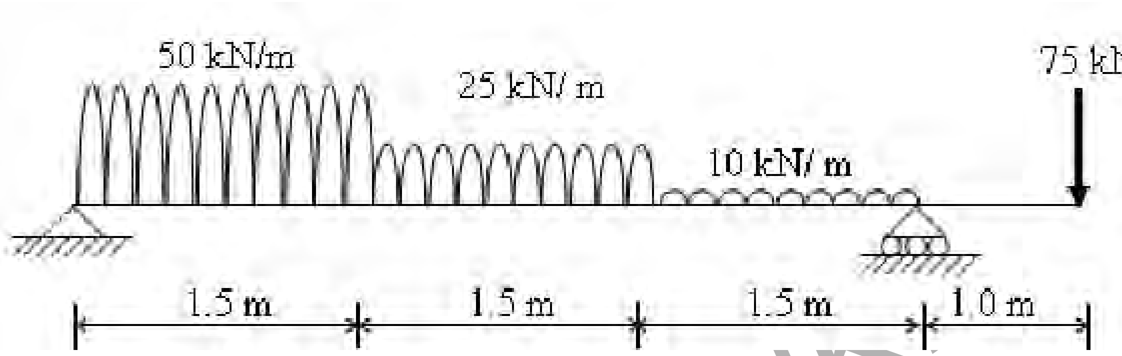

Figure 7

8. Compute the maximum deflections and support rotations in the beams of the following figure 8 using

   (a) The methods of integration

   (b) The method of moment area. [15]

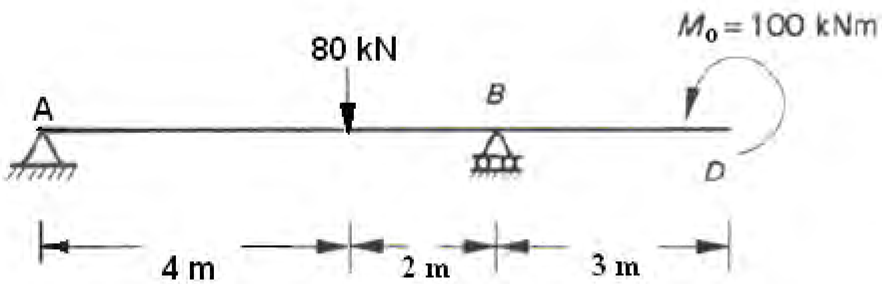

Figure 8

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Code No: A109210103 **R09** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
STRENGTH OF MATERIALS-I
Civil Engineering

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. A simply supported steel beam of span 6m has I-section 350 mm deep and 165 mm wide has flanges 9.8 mm thick and web 7.0 mm thick. If the maximum permissible stress is 165 N/mm^2, find the safe uniformly distributed load that the section can carry. [15]

2. A circular beam of 150 mm diameter is subjected to a shear force of 25 kN. Determine the maximum shear stress, average shear stress and the shear stress at a distance of 25 mm from neutral axis. [15]

3. Develop the equilibrium equation for spherical shells subjected to radial pressure. [15]

4. Draw the shear force and bending moment diagrams for a simply supported beam loaded as shown in figure 4. Also find and show the magnitude of maximum bending moment. [15]

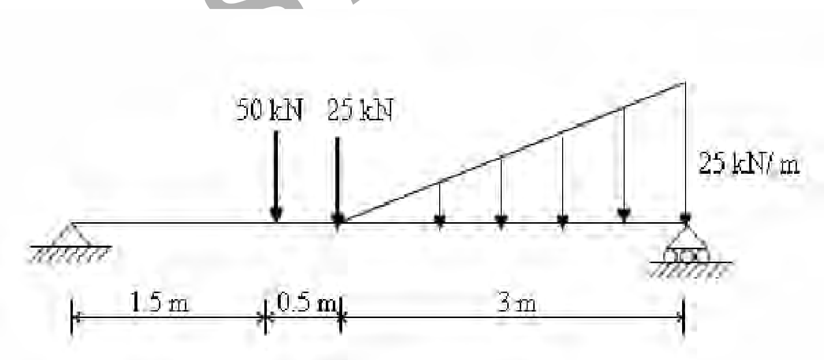

Figure 4

5. (a) Determine the deflection profile of a simply supported beam of 8 m span with an overhang of 2.5 m at one end when subjected to a clockwise moment of 100 kNm at 3 m from its left support. Assume EI = 20 MNm^2.

   (b) Determine the mid-span displacements and slopes at the supports in the beams shown in figure 5 using the method of integration. Assume constant flexural rigidity for the beams. [15]

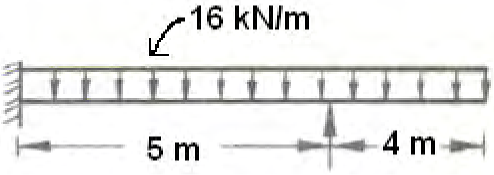

Figure 5

6. At a certain point in a piece of elastic material there are normal stresses of 45 N/mm^2 tension and 30N/mm^2 compression on two planes at right angles to one another, together with shearing stresses of 22.50 N/mm^2 on the same planes. If the loading on the material is increased so that the stresses reach values of K times those given, find the maximum value of K if the maximum direct stress is not to exceed 120 N/mm^2 and the maximum shearing stress is not to exceed 75 N/mm^2. [15]

7. A mild steel bar 25 mm in diameter and 500 mm long is encased in a brass tube having external diameter is 40 mm and internal diameter is 32 mm. the composite bar is heated through 500 C. Calculate the stresses induced in each metal. The coefficient of expansion for steel and brass are 1.08×10^{-5} and 16.5×10^{-6} per degree centigrade respectively. $E = 2.1 \times 10^5$ N/mm^2 for steel and 1.0×10^5 N/mm^2 for brass. [15]

8. A pressurized cylinder of 325 mm internal diameter and 4 mm wall thickness registered a pressure of 0.18 MPa when subjected to an axial compression of 63 kN. Determine the poisons ratio of the material. Assume E = 150 GPa for the cylinder and K = 2.5 GPa for the fluid. [15]

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