Code No: NR210302 **NR** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF SOLIDS
Common to ME, MECT, MEP, AE, MMT

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions. [8]
   (b) A piece of material is subjected to a tensile stress of 60 N/mm^2 and 30 N/mm^2 at right angles to each other. Find fully the stresses on a plane the normal of which makes an angle of 40^0 with the 60 N/mm^2 stress. [8]

2. (a) A simply supported beam of span L has second moment of area of 2I for the left hand half of the span and I for the right hand half. The beam carries a load of intensity 2w uniformly distributed over the left hand half of the span and of intensity w uniformly distributed over the right hand half. Obtain an expression for deflection at the centre of the span. If a prop is now placed at the centre of the span to restore the beam to its original level at this point, find the force on the prop. [8]
   (b) A freely supported beam of span L carries a central load W. The section of the beam is so designed that the moment of intertia of the section increases from I at the ends to 2I at the middle. Calculate the central deflection. [8]

3. Sketch the shear force and bending moment diagrams showing the salient values for the loaded beam shown in the figure 3 below. [16]

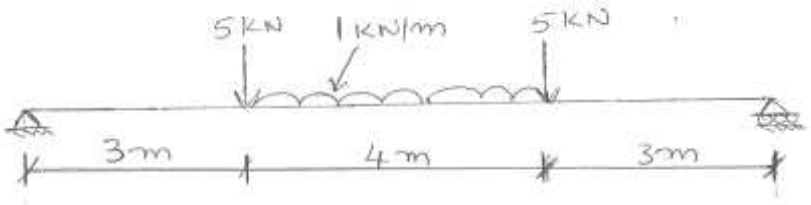

Figure 3

4. A solid circular shaft of diameter d has the same weight as a hollow circular shaft of mean diameter d. Assuming the same maximum shear stress in both the cases, determine the ratio of torques transmitted by the two shafts. Also compare the angles of twist per unit length in these two shafts. [16]

5. (a) State the assumptions involved in the theory of simple bending. [6]
   (b) Derive the Bending equation from fist principle. [10]

6. (a) A gun metal tube of 60mm bore, wall thickness 1.25mm is closely wound externally by a steel wire 0.5mm diameter. Determine the tension under which

the wire must be wound on the tube, if an internal radial pressure of 1.75 MN/ m^2 is required before the tube is subjected to the tensile stress in the circumferential direction. Take: For tube: E = 102 GN/ m^2, Poisson's ratio = 0.35. [8]

(b) A copper tube 35mm bore and 3 mm thick is plugged at its ends. It is just filled with water atmospheric pressure. If an axial compressive load of 8 kN is applied to the plugs, find by how much the water pressure will Increase. The plugs are assumed to be rigid and fixed to the tube. [8]

7. (a) Define Factor of safety, Poisson's ratio and strain energy. [6]

(b) Show that the volumetric strain of a body is the algebraic sum of the linear strains in three mutually perpendicular directions. [10]

8. (a) What do you understand by Poisson's ratio? Derive an expression for volumetric strain. [8]

(b) Obtain a relation for the stress induced in a body if a load P is applied with an impact. [8]

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Code No: NR210302 **NR** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF SOLIDS
Common to ME, MECT, MEP, AE, MMT

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A simply supported beam of span L has second moment of area of 2I for the left hand half of the span and I for the right hand half. The beam carries a load of intensity 2w uniformly distributed over the left hand half of the span and of intensity w uniformly distributed over the right hand half. Obtain an expression for deflection at the centre of the span. If a prop is now placed at the centre of the span to restore the beam to its original level at this point, find the force on the prop. [8]
   (b) A freely supported beam of span L carries a central load W. The section of the beam is so designed that the moment of intertia of the section increases from I at the ends to 2I at the middle. Calculate the central deflection. [8]

2. (a) A gun metal tube of 60mm bore, wall thickness 1.25mm is closely wound externally by a steel wire 0.5mm diameter. Determine the tension under which the wire must be wound on the tube, if an internal radial pressure of 1.75 MN/ m^2 is required before the tube is subjected to the tensile stress in the circumferential direction. Take: For tube: E = 102 GN/ m^2, Poisson's ratio = 0.35. [8]
   (b) A copper tube 35mm bore and 3 mm thick is plugged at its ends. It is just filled with water atmospheric pressure. If an axial compressive load of 8 kN is applied to the plugs, find by how much the water pressure will Increase. The plugs are assumed to be rigid and fixed to the tube. [8]

3. (a) State the assumptions involved in the theory of simple bending. [6]
   (b) Derive the Bending equation from fist principle. [10]

4. Sketch the shear force and bending moment diagrams showing the salient values for the loaded beam shown in the figure 4 below. [16]

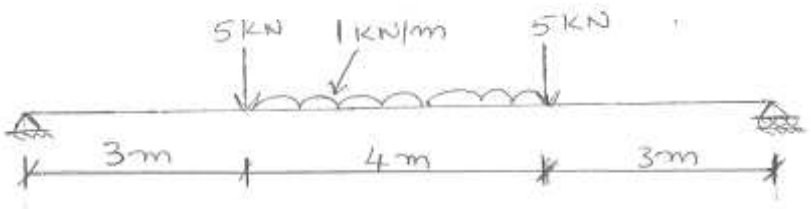

Figure 4

5. (a) Define Factor of safety, Poisson's ratio and strain energy. [6]
   (b) Show that the volumetric strain of a body is the algebraic sum of the linear strains in three mutually perpendicular directions. [10]

6. A solid circular shaft of diameter d has the same weight as a hollow circular shaft of mean diameter d. Assuming the same maximum shear stress in both the cases, determine the ratio of torques transmitted by the two shafts. Also compare the angles of twist per unit length in these two shafts. [16]

7. (a) Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions. [8]

   (b) A piece of material is subjected to a tensile stress of 60 N/mm^2 and 30 N/mm^2 at right angles to each other. Find fully the stresses on a plane the normal of which makes an angle of 40^0 with the 60 N/mm^2 stress. [8]

8. (a) What do you understand by Poisson's ratio? Derive an expression for volumetric strain. [8]

   (b) Obtain a relation for the stress induced in a body if a load P is applied with an impact. [8]

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Code No: NR210302 **NR** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF SOLIDS
Common to ME, MECT, MEP, AE, MMT

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define Factor of safety, Poisson's ratio and strain energy. [6]
   (b) Show that the volumetric strain of a body is the algebraic sum of the linear strains in three mutually perpendicular directions. [10]

2. (a) State the assumptions involved in the theory of simple bending. [6]
   (b) Derive the Bending equation from fist principle. [10]

3. Sketch the shear force and bending moment diagrams showing the salient values for the loaded beam shown in the figure 3 below. [16]

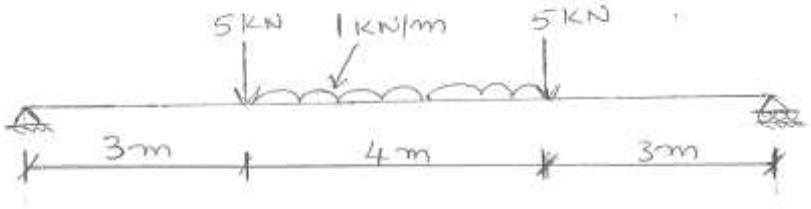

Figure 3

4. (a) A gun metal tube of 60mm bore, wall thickness 1.25mm is closely wound externally by a steel wire 0.5mm diameter. Determine the tension under which the wire must be wound on the tube, if an internal radial pressure of 1.75 MN/ m^2 is required before the tube is subjected to the tensile stress in the circumferential direction. Take: For tube: E = 102 GN/ m^2, Poisson's ratio = 0.35. [8]
   (b) A copper tube 35mm bore and 3 mm thick is plugged at its ends. It is just filled with water atmospheric pressure. If an axial compressive load of 8 kN is applied to the plugs, find by how much the water pressure will Increase. The plugs are assumed to be rigid and fixed to the tube. [8]

5. (a) What do you understand by Poisson's ratio? Derive an expression for volumetric strain. [8]
   (b) Obtain a relation for the stress induced in a body if a load P is applied with an impact. [8]

6. (a) Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions. [8]

(b) A piece of material is subjected to a tensile stress of 60 N/mm^2 and 30 N/mm^2 at right angles to each other. Find fully the stresses on a plane the normal of which makes an angle of 40^0 with the 60 N/mm^2 stress. [8]

7. A solid circular shaft of diameter d has the same weight as a hollow circular shaft of mean diameter d. Assuming the same maximum shear stress in both the cases, determine the ratio of torques transmitted by the two shafts. Also compare the angles of twist per unit length in these two shafts. [16]

8. (a) A simply supported beam of span L has second moment of area of 2I for the left hand half of the span and I for the right hand half. The beam carries a load of intensity 2w uniformly distributed over the left hand half of the span and of intensity w uniformly distributed over the right hand half. Obtain an expression for deflection at the centre of the span. If a prop is now placed at the centre of the span to restore the beam to its original level at this point, find the force on the prop. [8]

(b) A freely supported beam of span L carries a central load W. The section of the beam is so designed that the moment of intertia of the section increases from I at the ends to 2I at the middle. Calculate the central deflection. [8]

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Code No: NR210302 **NR** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF SOLIDS
Common to ME, MECT, MEP, AE, MMT

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State the assumptions involved in the theory of simple bending. [6]
   (b) Derive the Bending equation from fist principle. [10]

2. (a) A simply supported beam of span L has second moment of area of 2I for the left hand half of the span and I for the right hand half. The beam carries a load of intensity 2w uniformly distributed over the left hand half of the span and of intensity w uniformly distributed over the right hand half. Obtain an expression for deflection at the centre of the span. If a prop is now placed at the centre of the span to restore the beam to its original level at this point, find the force on the prop. [8]
   (b) A freely supported beam of span L carries a central load W. The section of the beam is so designed that the moment of intertia of the section increases from I at the ends to 2I at the middle. Calculate the central deflection. [8]

3. A solid circular shaft of diameter d has the same weight as a hollow circular shaft of mean diameter d. Assuming the same maximum shear stress in both the cases, determine the ratio of torques transmitted by the two shafts. Also compare the angles of twist per unit length in these two shafts. [16]

4. (a) Define Factor of safety, Poisson's ratio and strain energy. [6]
   (b) Show that the volumetric strain of a body is the algebraic sum of the linear strains in three mutually perpendicular directions. [10]

5. (a) Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions. [8]
   (b) A piece of material is subjected to a tensile stress of 60 N/mm^2 and 30 N/mm^2 at right angles to each other. Find fully the stresses on a plane the normal of which makes an angle of 40^0 with the 60 N/mm^2 stress. [8]

6. Sketch the shear force and bending moment diagrams showing the salient values for the loaded beam shown in the figure 6 below. [16]

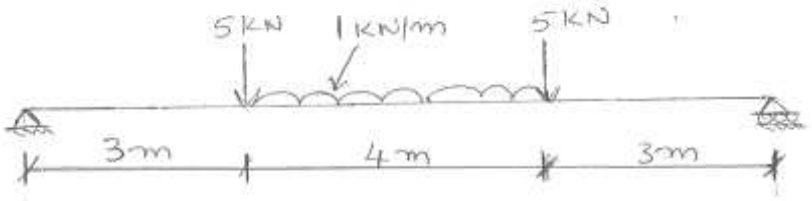

Figure 6

7. (a) A gun metal tube of 60mm bore, wall thickness 1.25mm is closely wound externally by a steel wire 0.5mm diameter. Determine the tension under which the wire must be wound on the tube, if an internal radial pressure of 1.75 MN/ m^2 is required before the tube is subjected to the tensile stress in the circumferential direction. Take: For tube: E = 102 GN/ m^2, Poisson's ratio = 0.35. [8]

   (b) A copper tube 35mm bore and 3 mm thick is plugged at its ends. It is just filled with water atmospheric pressure. If an axial compressive load of 8 kN is applied to the plugs, find by how much the water pressure will Increase. The plugs are assumed to be rigid and fixed to the tube. [8]

8. (a) What do you understand by Poisson's ratio? Derive an expression for volumetric strain. [8]

   (b) Obtain a relation for the stress induced in a body if a load P is applied with an impact. [8]

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