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Code No: 07A32101 **R07** **Set No. 2**

II B.Tech I Semester Examinations,May 2011
FOUNDATION OF SOLID MECHANICS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A shaft transmits 300 kW power at 120 r.p.m. The allowable shear stress is 70 N/mm^2. Determine:
   (a) The necessary diameter of solid circular shaft
   (b) The necessary diameter of hollow circular section, the inside diameter being 2/3 of the external diameter.
   (c) Taking the density of material is 77 kN/m^3, calculate the % saving in the material if hollow shaft is used. [16]

2. A thin cylinder of internal diameter 2.0 m contains a fluid at an internal pressure of 3 N/mm^2. Determine the minimum thickness required if:
   (a) the longitudinal stress is not to exceed 30 N/mm^2 and
   (b) Circumferential stress is not to exceed 40 N/mm^2. [16]

3. A cantilever of T-section (Flange: 120mm × 20mm; Web: 130 mm × 20mm) is 2.8 m long and the deflection at the free end is not to exceed 2mm, determine: The maximum value of W, Direction of neutral axis with respect to vertical axis. [16]

4. (a) A beam of symmetrical section has a depth of 450 mm and a moment of inertia of 27,536 × 10^4 mm^4 about its axis of bending. Find the maximum permissible span for this beam if simply supported at the ends. It has to carry a uniformly distributed load of 25 kN/m without exceeding a bending stress of 120 N/mm^2.
   (b) A cast iron beam 25 mm square in section and 600 mm long is freely supported at the ends. It fails with a central load of 2.5 kN. What load at the free end will break a cantilever for the same material 50 mm wide × 100 mm deep and 1500 mm long. [16]

5. A cantilever of length 3m carries two point loads of 2 kN at the free end and 4 kN at a distance of 1 m from the free end. Find the slope and deflection at the free end. Take E = 2 × 10^5 N/mm^2 and I = 10^8 mm^4. [16]

6. A beam section shown in figure 6 is subjected to a shear force of 10kN. Plot a graph showing the variation of shear stress along the depth of section. Determine also the ratio of maximum shear stress and mean shear stress. [16]

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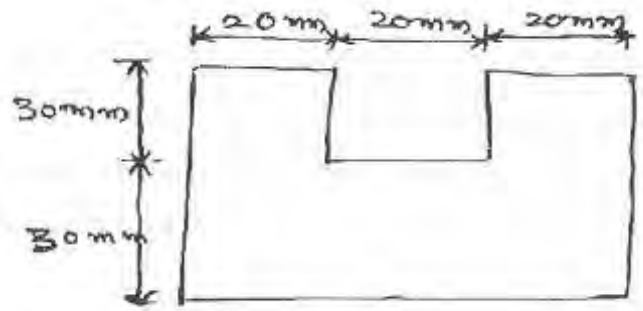

Figure 6

7. (a) Derive an expression between shear force and bending moment with suitable assumptions.

   (b) Draw the shear force & Bending moment diagrams for a cantilever subjected to the loads as shown in figure 7b. [8+8]

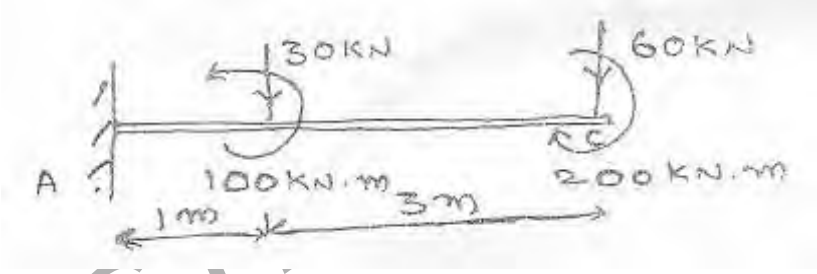

Figure 7b

8. A welded joint is provided to connect two tie bars 150 mm × 10mm as shown in figure 8. The working stress in the bar is 120 MN/m ^{2}. Investigate the design. If the size of the fillet is 12mm. Take the working stress in the end fillet as 102.5 MN/m ^{2} and that in the diagonal fillet as 70 MN/m^2. [16]

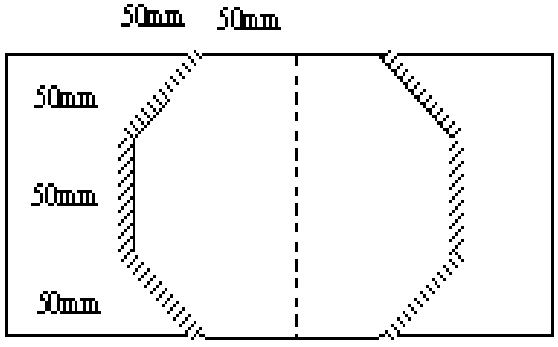

Figure 8

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II B.Tech I Semester Examinations,May 2011
FOUNDATION OF SOLID MECHANICS
Aeronautical Engineering

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

Answer any FIVE Questions
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⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Derive an expression between shear force and bending moment with suitable assumptions.
   (b) Draw the shear force & Bending moment diagrams for a cantilever subjected to the loads as shown in figure 1b. [8+8]

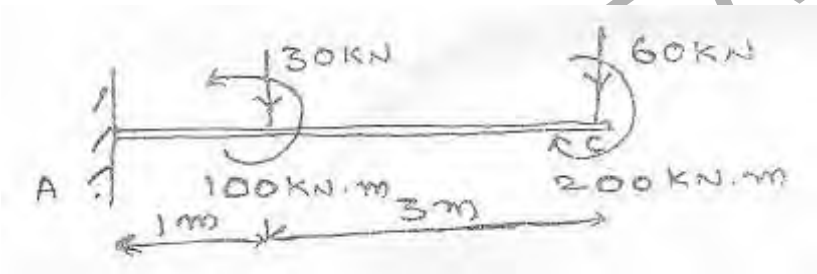

Figure 1b

2. A thin cylinder of internal diameter 2.0 m contains a fluid at an internal pressure of 3 N/mm^2. Determine the minimum thickness required if:
   (a) the longitudinal stress is not to exceed 30 N/mm^2 and
   (b) Circumferential stress is not to exceed 40 N/mm^2. [16]

3. A cantilever of T-section (Flange: 120mm × 20mm; Web: 130 mm × 20mm) is 2.8 m long and the deflection at the free end is not to exceed 2mm, determine: The maximum value of W, Direction of neutral axis with respect to vertical axis. [16]

4. A cantilever of length 3m carries two point loads of 2 kN at the free end and 4 kN at a distance of 1 m from the free end. Find the slope and deflection at the free end. Take E = 2 × 10^5 N/mm^2 and I = 10^8 mm^4. [16]

5. (a) A beam of symmetrical section has a depth of 450 mm and a moment of inertia of 27,536 × 10^4 mm^4 about its axis of bending. Find the maximum permissible span for this beam if simply supported at the ends. It has to carry a uniformly distributed load of 25 kN/m without exceeding a bending stress of 120 N/mm^2.
   (b) A cast iron beam 25 mm square in section and 600 mm long is freely supported at the ends. It fails with a central load of 2.5 kN. What load at the free end will break a cantilever for the same material 50 mm wide × 100 mm deep and 1500 mm long. [16]

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6. A beam section shown in figure 6 is subjected to a shear force of 10kN. Plot a graph showing the variation of shear stress along the depth of section. Determine also the ratio of maximum shear stress and mean shear stress. [16]

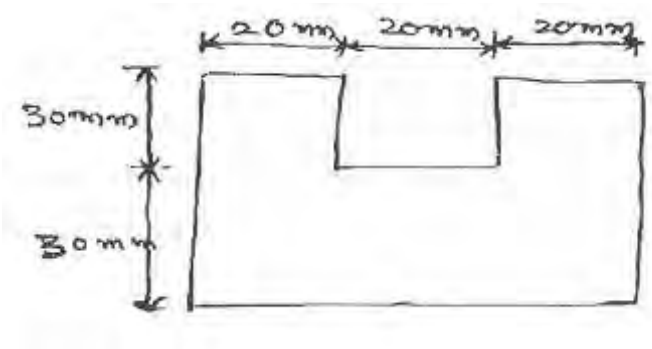

Figure 6

7. A shaft transmits 300 kW power at 120 r.p.m. The allowable shear stress is 70 N/mm^2. Determine:
   (a) The necessary diameter of solid circular shaft
   (b) The necessary diameter of hollow circular section, the inside diameter being 2/3 of the external diameter.
   (c) Taking the density of material is 77 kN/m^3, calculate the % saving in the material if hollow shaft is used. [16]

8. A welded joint is provided to connect two tie bars 150 mm × 10mm as shown in figure 8. The working stress in the bar is 120 MN/m ^{2}. Investigate the design. If the size of the fillet is 12mm. Take the working stress in the end fillet as 102.5 MN/m ^{2} and that in the diagonal fillet as 70 MN/m^2. [16]

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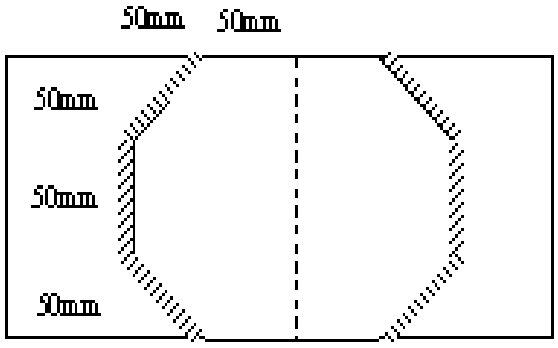

Figure 8

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Aeronautical Engineering

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

Answer any FIVE Questions
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1. A cantilever of length 3m carries two point loads of 2 kN at the free end and 4 kN at a distance of 1 m from the free end. Find the slope and deflection at the free end. Take E = 2×10^5 N/mm^2 and I = 10^8 mm^4. [16]

2. A welded joint is provided to connect two tie bars 150 mm × 10mm as shown in figure 2. The working stress in the bar is 120 MN/m ^{2}. Investigate the design. If the size of the fillet is 12mm. Take the working stress in the end fillet as 102.5 MN/m ^{2} and that in the diagonal fillet as 70 MN/m^2. [16]

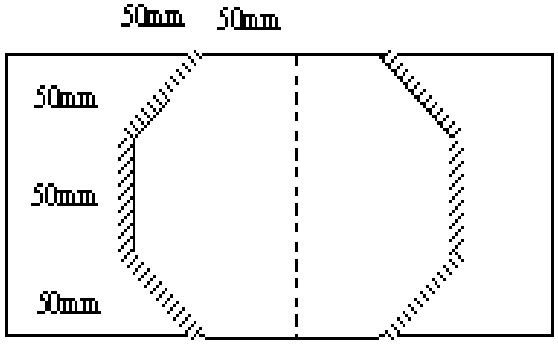

Figure 2

3. (a) Derive an expression between shear force and bending moment with suitable assumptions.
   (b) Draw the shear force & Bending moment diagrams for a cantilever subjected to the loads as shown in figure 3b. [8+8]

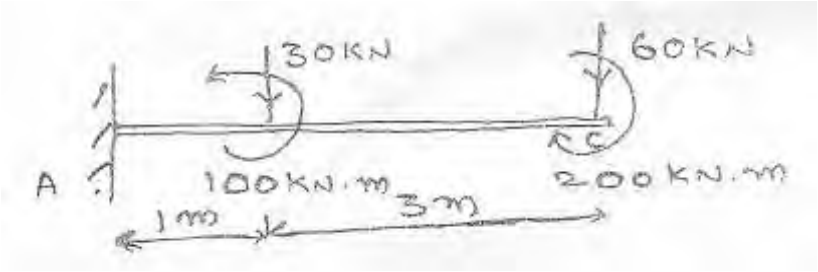

Figure 3b

4. A cantilever of T-section (Flange: 120mm × 20mm; Web: 130 mm × 20mm) is 2.8

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m long and the deflection at the free end is not to exceed 2mm, determine: The maximum value of W, Direction of neutral axis with respect to vertical axis. [16]

5. A shaft transmits 300 kW power at 120 r.p.m. The allowable shear stress is 70 N/mm^2. Determine:
   (a) The necessary diameter of solid circular shaft
   (b) The necessary diameter of hollow circular section, the inside diameter being 2/3 of the external diameter.
   (c) Taking the density of material is 77 kN/m^3, calculate the % saving in the material if hollow shaft is used. [16]

6. A beam section shown in figure 6 is subjected to a shear force of 10kN. Plot a graph showing the variation of shear stress along the depth of section. Determine also the ratio of maximum shear stress and mean shear stress. [16]

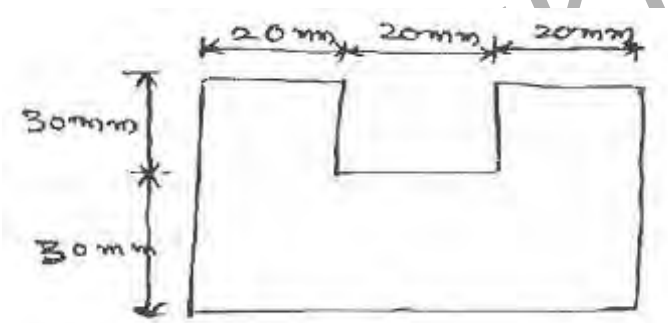

Figure 6

7. A thin cylinder of internal diameter 2.0 m contains a fluid at an internal pressure of 3 N/mm^2. Determine the minimum thickness required if:
   (a) the longitudinal stress is not to exceed 30 N/mm^2 and
   (b) Circumferential stress is not to exceed 40 N/mm^2. [16]

8. (a) A beam of symmetrical section has a depth of 450 mm and a moment of inertia of 27,536 $\times$ 10^4 mm^4 about its axis of bending. Find the maximum permissible span for this beam if simply supported at the ends. It has to carry a uniformly distributed load of 25 kN/m without exceeding a bending stress of 120 N/mm^2.
   (b) A cast iron beam 25 mm square in section and 600 mm long is freely supported at the ends. It fails with a central load of 2.5 kN. What load at the free end will break a cantilever for the same material 50 mm wide $\times$ 100 mm deep and 1500 mm long. [16]

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Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A beam section shown in figure 1 is subjected to a shear force of 10kN. Plot a graph showing the variation of shear stress along the depth of section. Determine also the ratio of maximum shear stress and mean shear stress. [16]

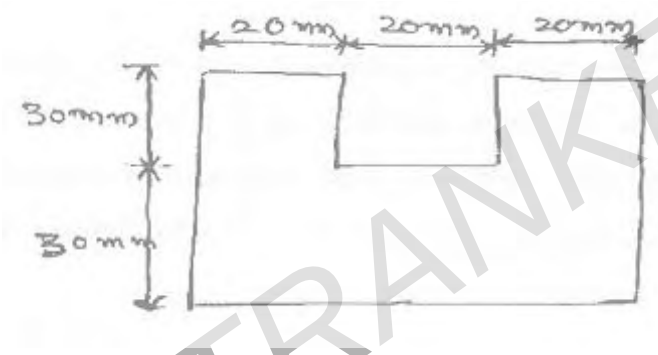

Figure 1

2. A cantilever of length 3m carries two point loads of 2 kN at the free end and 4 kN at a distance of 1 m from the free end. Find the slope and deflection at the free end. Take E = 2×10^5 N/mm^2 and I = 10^8 mm^4. [16]

3. (a) A beam of symmetrical section has a depth of 450 mm and a moment of inertia of 27,536 $\times$ 10^4 mm^4 about its axis of bending. Find the maximum permissible span for this beam if simply supported at the ends. It has to carry a uniformly distributed load of 25 kN/m without exceeding a bending stress of 120 N/mm^2.

   (b) A cast iron beam 25 mm square in section and 600 mm long is freely supported at the ends. It fails with a central load of 2.5 kN. What load at the free end will break a cantilever for the same material 50 mm wide $\times$ 100 mm deep and 1500 mm long. [16]

4. A welded joint is provided to connect two tie bars 150 mm $\times$ 10mm as shown in figure 4. The working stress in the bar is 120 MN/m ^{2}. Investigate the design. If the size of the fillet is 12mm. Take the working stress in the end fillet as 102.5 MN/m ^{2} and that in the diagonal fillet as 70 MN/m^2. [16]

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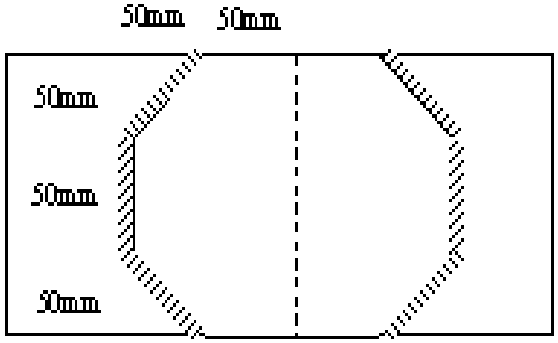

Figure 4

5. (a) Derive an expression between shear force and bending moment with suitable assumptions.

   (b) Draw the shear force & Bending moment diagrams for a cantilever subjected to the loads as shown in figure 5b. [8+8]

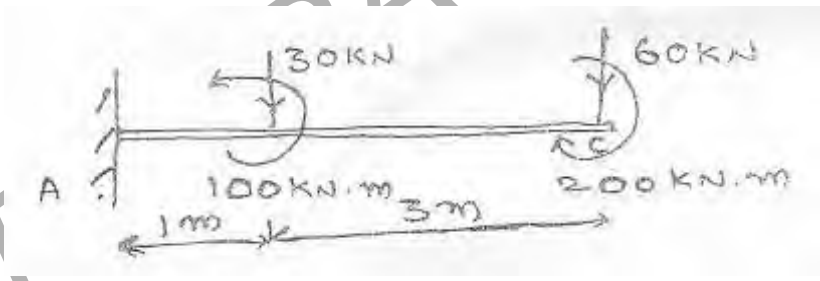

Figure 5b

6. A thin cylinder of internal diameter 2.0 m contains a fluid at an internal pressure of 3 N/mm^2. Determine the minimum thickness required if:

   (a) the longitudinal stress is not to exceed 30 N/mm^2 and

   (b) Circumferential stress is not to exceed 40 N/mm^2. [16]

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   (c) Taking the density of material is 77 kN/m^3, calculate the % saving in the material if hollow shaft is used. [16]

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