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

II B.Tech I Semester Examinations,November 2010
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 round steel rod ACB, 1.8 m long, is firmly held at its ends A and B. AC is 1.2 m and 50 mm dia; BC is 0.6 m and 40 mm dia. At C, a twisting couple of moment 580 N-m is applied. Find the moment of resisting couples at A and B and the maximum shear stresses in parts AC and BC of the rod. [16]

2. A timber beam 175mm wide × 300mm deep is somply supported over a span of 5.5m. It is loaded a with a u.d.l of 10 kN/m. Calculate:
   (a) Shear stress developed om a layer 60mm above neatral axis, located at 2m from LHS.
   (b) Maximum shear stress on the above section.
   (c) Maximum shear stres anywhere in the beam. [5+5+6]

3. Figure 3 shows a 75 mm × 75 mm angle having $I_{xx} = I_{yy} = 87.36 \times 10^{-8}$ m^4. It is used as a freely supported beam with one leg vertical. On the application of the bending moment in the vertical plane YY the mid-section of the beam deflects in the direction AA_1 at $33^0\ 15^1$ to the vertical. Calculate the second moment of area of the section about its principal axis. What is the bending stress at the corner B if the bending moment is 1.5 kNm? [16]

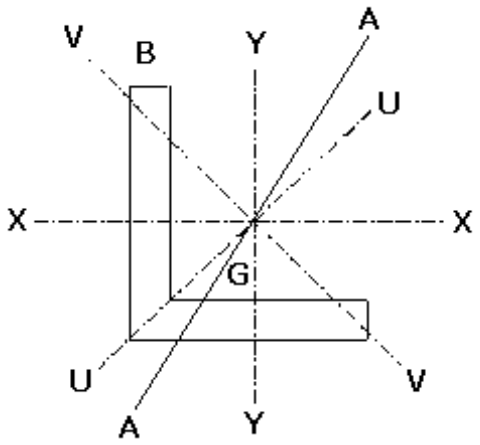

Figure 3

4. Design a double cover butt joint to withstand a load of 250 kN. The plates to be joined are 20 cm wide and 1.25 cm thick; 2 cm diameter rivets are to be used in diamond fashion of rivets rows so as to increase the efficiency of the joint. Permissible stresses are; shear 70 MN/m ^{2} bearing 190 MN/m ^{2} and tension 110 MN/m^2. What is the efficiency of the joint? [16]

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5. Determine the slope and deflection at the free end of a cantilever of length 4 m, which is carrying a uniformly distributed load of 12 kN/m over a length of 3 m from the fixed end. Take EI = 2×10^{13} N.mm^2. [16]

6. A beam ABCD, 20 m long, is loaded as shown in Figure 6. The beam is supported at B and C and has an overhang of 2 m to the left of the support B and an overhang of K metres to the right of support C which is in the right hand half of the beam. Determine the value of K if the mid-pint of the beam is the point of inflexion and for this arrangement, plot S.F. and B.M. diagrams indicating the principal numerical values. [16]

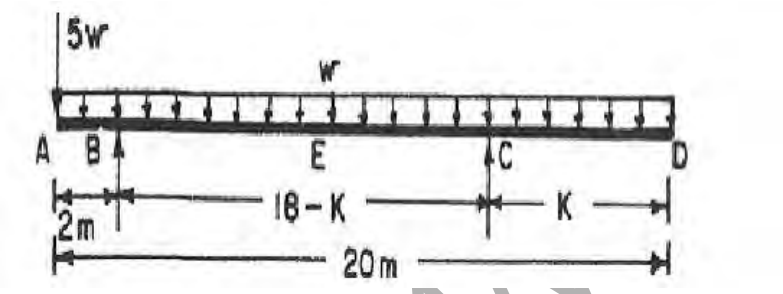

Figure 6

7. A beam 500 mm deep of a symmetrical section has I = 1×10^8 mm^4 and is simply supported over a span of 10 metres. Calculate

   (a) The uniformly distributed load it may carry if the maximum bending stress is not to exceed 150 N/mm^2.

   (b) The maximum bending stress if the beam carries a central point load of 25 kN. [16]

8. A boiler is subjected to an internal steam pressure of 2 N/mm^2. The thickness of boiler plate is 2.6cm and permissible tensile stress is 120 N/mm^2. Find out the maximum diameter, when efficiency of longitudinal joint is 90% and that of circumferential joint is 40%. [16]

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Code No: 07A32101 **R07** **Set No. 4**

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FOUNDATION OF SOLID MECHANICS
Aeronautical Engineering

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

Answer any FIVE Questions
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1. Design a double cover butt joint to withstand a load of 250 kN. The plates to be joined are 20 cm wide and 1.25 cm thick; 2 cm diameter rivets are to be used in diamond fashion of rivets rows so as to increase the efficiency of the joint. Permissible stresses are; shear 70 MN/m ^{2} bearing 190 MN/m ^{2} and tension 110 MN/m^2. What is the efficiency of the joint? [16]

2. A round steel rod ACB, 1.8 m long, is firmly held at its ends A and B. AC is 1.2 m and 50 mm dia; BC is 0.6 m and 40 mm dia. At C, a twisting couple of moment 580 N-m is applied. Find the moment of resisting couples at A and B and the maximum shear stresses in parts AC and BC of the rod. [16]

3. Figure 3 shows a 75 mm × 75 mm angle having $I_{xx} = I_{yy} = 87.36 \times 10^{-8}$ m^4. It is used as a freely supported beam with one leg vertical. On the application of the bending moment in the vertical plane YY the mid-section of the beam deflects in the direction AA_1 at $33^0\ 15^1$ to the vertical. Calculate the second moment of area of the section about its principal axis. What is the bending stress at the corner B if the bending moment is 1.5 kNm? [16]

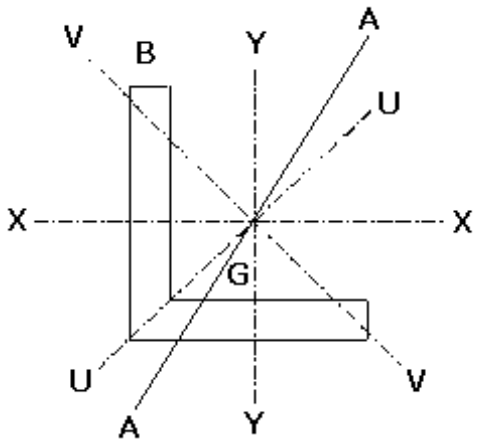

Figure 3

4. A beam ABCD, 20 m long, is loaded as shown in Figure 4. The beam is supported at B and C and has an overhang of 2 m to the left of the support B and an overhang of K metres to the right of support C which is in the right hand half of the beam. Determine the value of K if the mid-pint of the beam is the point of inflexion and for this arrangement, plot S.F. and B.M. diagrams indicating the principal numerical values. [16]

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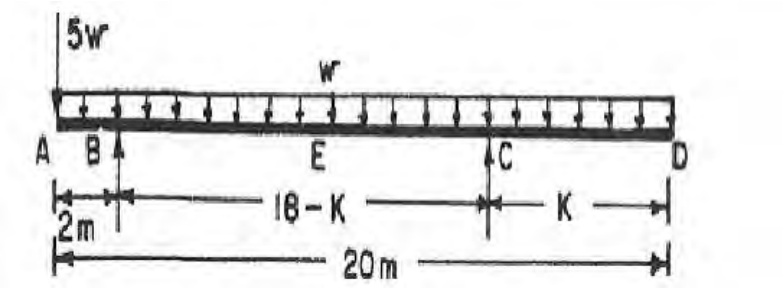

Figure 4

5. A boiler is subjected to an internal steam pressure of 2 N/mm^2. The thickness of boiler plate is 2.6cm and permissible tensile stress is 120 N/mm^2. Find out the maximum diameter, when efficiency of longitudinal joint is 90% and that of circumferential joint is 40%. [16]

6. A timber beam 175mm wide × 300mm deep is somply supported over a span of 5.5m. It is loaded a with a u.d.l of 10 kN/m. Calculate:

   (a) Shear stress developed om a layer 60mm above neatral axis, located at 2m from LHS.

   (b) Maximum shear stress on the above section.

   (c) Maximum shear stres anywhere in the beam. [5+5+6]

7. A beam 500 mm deep of a symmetrical section has I = 1 × 10^8 mm^4 and is simply supported over a span of 10 metres. Calculate

   (a) The uniformly distributed load it may carry if the maximum bending stress is not to exceed 150 N/mm^2.

   (b) The maximum bending stress if the beam carries a central point load of 25 kN. [16]

8. Determine the slope and deflection at the free end of a cantilever of length 4 m, which is carrying a uniformly distributed load of 12 kN/m over a length of 3 m from the fixed end. Take EI = 2 × 10^{13} N.mm^2. [16]

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Code No: 07A32101 **R07** **Set No. 1**

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1. A beam ABCD, 20 m long, is loaded as shown in Figure 1. The beam is supported at B and C and has an overhang of 2 m to the left of the support B and an overhang of K metres to the right of support C which is in the right hand half of the beam. Determine the value of K if the mid-pint of the beam is the point of inflexion and for this arrangement, plot S.F. and B.M. diagrams indicating the principal numerical values. [16]

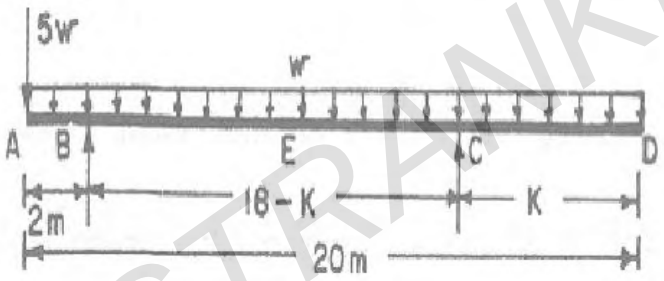

Figure 1

2. Determine the slope and deflection at the free end of a cantilever of length 4 m, which is carrying a uniformly distributed load of 12 kN/m over a length of 3 m from the fixed end. Take EI = 2×10^{13} N.mm^2. [16]

3. Design a double cover butt joint to withstand a load of 250 kN. The plates to be joined are 20 cm wide and 1.25 cm thick; 2 cm diameter rivets are to be used in diamond fashion of rivets rows so as to increase the efficiency of the joint. Permissible stresses are; shear 70 MN/m ^{2} bearing 190 MN/m ^{2} and tension 110 MN/m^2. What is the efficiency of the joint? [16]

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5. A timber beam 175mm wide × 300mm deep is somply supported over a span of 5.5m. It is loaded a with a u.d.l of 10 kN/m. Calculate:

   (a) Shear stress developed om a layer 60mm above neatral axis, located at 2m from LHS.

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6. A round steel rod ACB, 1.8 m long, is firmly held at its ends A and B. AC is 1.2 m and 50 mm dia; BC is 0.6 m and 40 mm dia. At C, a twisting couple of moment 580 N-m is applied. Find the moment of resisting couples at A and B and the maximum shear stresses in parts AC and BC of the rod. [16]

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8. Figure 8 shows a 75 mm $\times$ 75 mm angle having $I_{xx} = I_{yy} = 87.36 \times 10^{-8}$ m^4. It is used as a freely supported beam with one leg vertical. On the application of the bending moment in the vertical plane YY the mid-section of the beam deflects in the direction AA_1 at 33^0 15^1 to the vertical. Calculate the second moment of area of the section about its principal axis. What is the bending stress at the corner B if the bending moment is 1.5 kNm? [16]

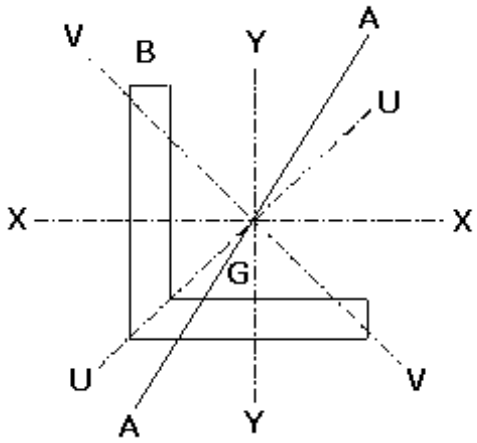

Figure 8

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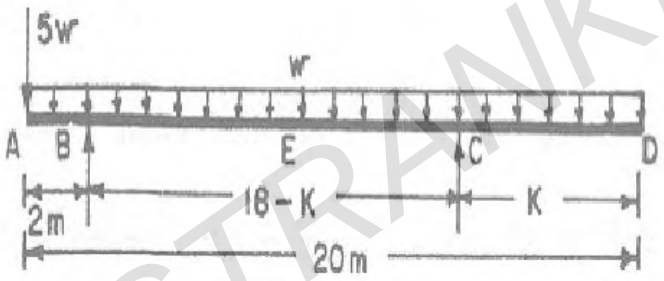

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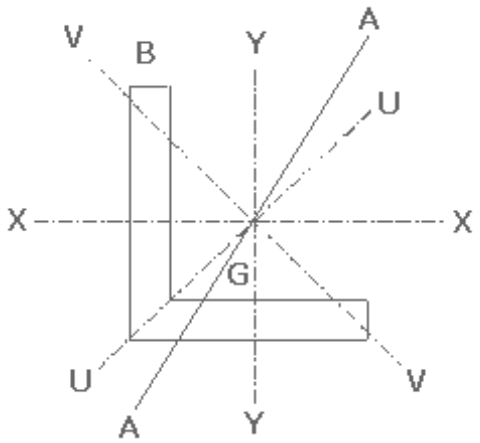

Figure 5

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