Code No: 07A52103 **R07** **Set No. 2**

III B.Tech I Semester Examinations,May 2011
AEROSPACE VECHICLE STRUCTURES-I
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Derive expressions to linear and shearing strains and what are the assumptions involved. [16]

2. Find the displacement at node 2 of a fixed beam shown in figure 1: subjected to an axial load P at node 2. [16]

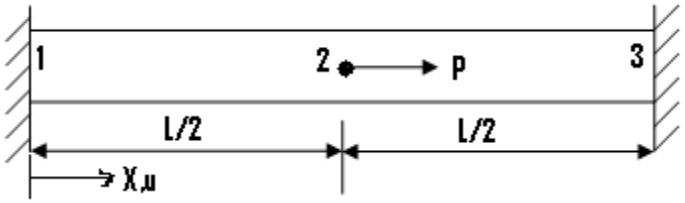

Figure 1:

3. (a) Derive all stress on an oblique section of a body subjected to direct stress in two mutually perpendicular directions.
   (b) A piece of material is subjected to normal stress of 50MPa in one direction and compressive stress of 30MPa in a direction at right angle to the previous one. Find the stress on a plane, the normal of which makes an angle of 30^0 with the 50MPa stress. [10+6]

4. Analyse the structure as shown in figure 2 by strain energy method. Sketch the bending moment diagram. [16]

5. An infinitely long steel beam 150 mm wide and 250 mm thick is resting on an elastic foundation whose modulus of foundation is 15.75 N/mm^2. The beam is subjected to a concentrated moment of 25N-m. Determine the maximum deflection and the maximum bending stresses in the beam. Assume E = 2.1x10^5 N/mm^2, v=0.30.[16]

6. Box beam of uniform thickness t = 3mm is subjected to a shear force of 20kN. Determine the variation of shear flow through out the cross-section. as shown in Figure 3

   [16]

7. A continuous beam supported at A, B, C of constant moment of Inertia carries a load of 10KN in mid span of AB and a central clockwise moment of 30KN-m in span BC, span AB is 10mts and span BC is 15mts. Find support moments and plot SFD and BMD for the beam. [16]

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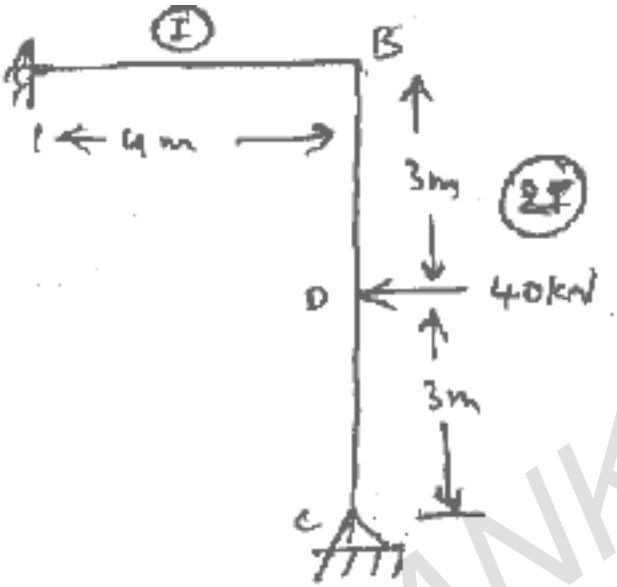

Figure 2:

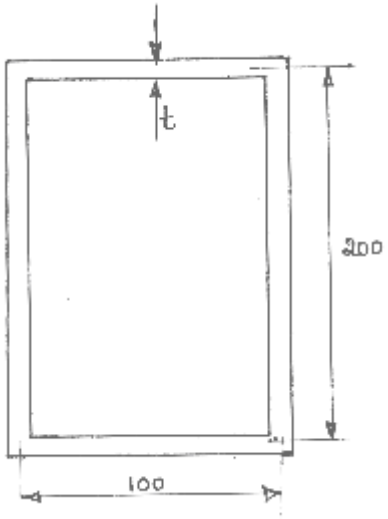

Figure 3:

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8. For a column with both ends hinged, subjected to compressive load P, derive the critical load equation using energy method. The buckling can be expressed as a function of distance x along the length of column L. y = A sin $\prod$ x / L [16]

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Code No: 07A52103 **R07** **Set No. 4**

III B.Tech I Semester Examinations,May 2011
AEROSPACE VECHICLE STRUCTURES-I
Aeronautical Engineering

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

Answer any FIVE Questions
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1. A steel beam of length 2 m is resting on an elastic foundation and has free ends. The beam is 10 mm wide and 120 mm thick and carries two concentrated forces of 1kN, one at each end. Determine the maximum bending stresses developed in the beam. Assume E = 2x10^5 N/mm^2, ν = 0.30 and modulus of foundation as 10.5N/mm^2. [16]

2. A simply supported beam length 6mts subjected to a u d l of 3KN/m throughout the beam. Take Youngs Modulus of the beam material is E and I is moment of inertia. Find the maximum deflection by using energy method. [16]

3. (a) Derive equations of equilibrium.
   (b) Derive compatibility equations. [8+8]

4. Find the natural frequencies of longitudinal vibrations of the stepped shaft of areas A and 2A and of equal length (L), when it is constrained at one end as shown in figure 4. [16]

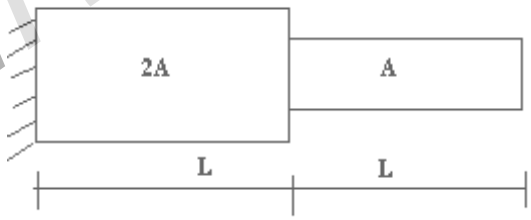

Figure 4:

5. Explain the procedure of finding the shear flow in to symmetric closed section, and location of shear centre for both single and multicell sections. [16]

6. (a) Derive Normal stress and Tangential stress on an oblique section of a body subjected to direct stress in two mutually perpendicular directions.
   (b) The principal stress at a point in the section of a boiler shell is 80MPa and 40MPa, both tensile. Find the normal, tangential and resultant stress intensities across a plane having the 80MPa stress. [10+6]

7. A length of the beam 'l' fixed at both ends and carries a u d l of 'w' KN/m. Spread through out the beam. Draw SFD and BMD. [16]

8. A built up beam of I section of flange 300 mm and thickness of 50 mm and a web of height 1000mm and thickness of 20 mm is simply supported at the ends. Compute its length given that when it is subjected to a load of 40kN per meter length it is deflected by 10 mm.Find out the safe load of this beam if it is used as a column with both ends fixed. Assume factor of safety =4. Use Euler's formula, E=210Gpa [16]

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III B.Tech I Semester Examinations,May 2011
AEROSPACE VECHICLE STRUCTURES-I
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Time: 3 hours **Max Marks: 80**

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1. A beam of length 'l' simply supported at ends and carries a concentrated load 'W' at a distance 'a' from each end. Find the deflection under the load and the deflection at the centre. [16]

2. Determine the displacement of nodes of the spring system shown as in figure 5: [16]

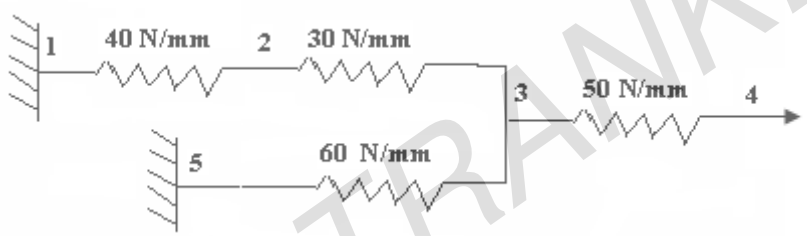

Figure 5:

3. Find the maximum length of a steel rod of 50mm diameter, used as a column with length both ends fixed and carrying a load of 25KN. Allow factor of safety 3. K = α = 1 / 7500. Crushing stress f_c = 320N/mm^2. [16]

4. (a) Derive the equations for Normal stress, Tangential stress, maximum shear stress and resultant stress for oblique plane making an angle θ with the normal cross section of a bar carrying an axial load

   (b) A tie rod of diameter 15mm subjected to a tensile force of 150kN. Find the normal tangential resultant intensity of plane making an angle of 30^0 with the plane of original stress. [8+8]

5. Determine the vertical deflection under 80 KN load for the beam shown in figure 6 using Castiglinos theorem E=210^5N/mm^2. [16]

6. Derive equation for the deflection of a continuous beam under elastic foundation. Find the expressions for maximum deflection and bending moment of beam under concentrated load. [16]

7. Uniform thickness t = 5mm. Determine the shear centre for an air craft box beam as shown in figure 7. [16]

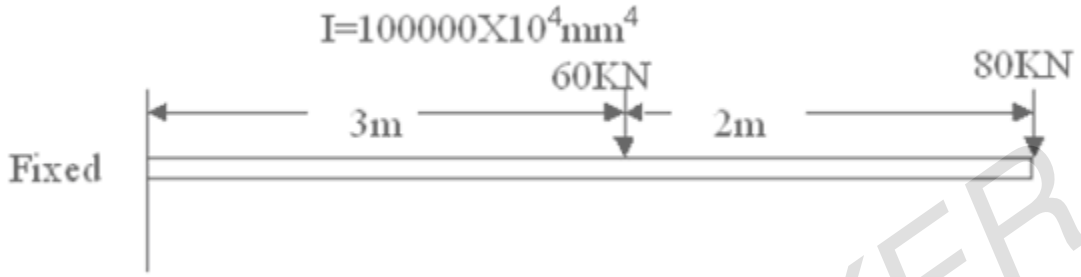

Figure 6:

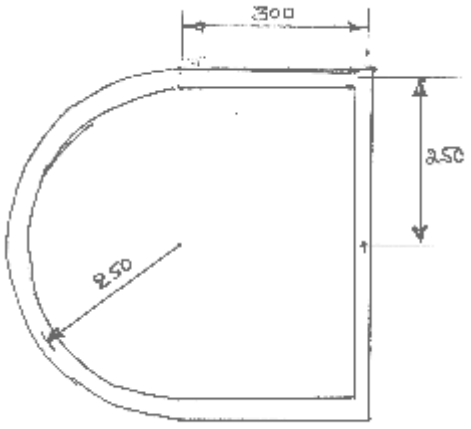

Figure 7:

8. (a) What is an Airys stress function in theory of elasticity?
   (b) Prove that the following are Airys stress function and examine the stress distribution represented by them:
      i. $\phi = Ax^2 + By^2$
      ii. $\phi = Ax^3$
      iii. $\phi = A(x^4 - 3x^2y^2)$ [16]

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Code No: 07A52103 **R07** **Set No. 3**

III B.Tech I Semester Examinations,May 2011
AEROSPACE VECHICLE STRUCTURES-I
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A cast iron beam 40mm wide and 80mm deep is simply supported on a span of 1.2m. The beam carries a point load of 15kN at the centre. Find the deflection at the centre. Take E = 108000N/mm^2. [16]

2. A spring and Mass attached at the end of the cantilever beam as shown in figure 8: The beam cross-section is 25mm wide and 5mm depth. Determine the natural frequency of the system. Take span is 120mm. E = 2X10^5 N/mm^2 [16]

Figure 8:

3. (a) Derive all stress on an oblique section of a body subjected to direct stress in two mutually perpendicular directions.
   (b) A tie bar is subjected to a tensile stress of 80MPa. Find the intensity of shear stress, normal stress and resultant stress on a plane. The normal of which is inclined at 30^0 to the axis of the bar. [10+6]

4. Derive the differential equations of equilibrium in rectangular coordinates for a three dimensional stress system with body forces and state the assumptions made. [16]

5. Explain the design of the column with reference to short, intermediate and long columns. What are the various empirical relations to predict the failure of columns? [16]

6. (a) What do you mean by beams on elastic foundation?
   (b) An infinitely long steel beam of unit width and 200 mm thick is resting on an elastic foundation whose modulus of foundation is 10 N/mm^2. A concentrated load 8kN is applied at a point on the beam. Determine the maximum deflection of the beam and the maximum bending stresses. Take E = 2x10^5 N/mm^2, v=0.28. [4+12]

Code No: 07A52103 **R07** **Set No. 3**

7. Uniform thickness locate the shear centre for the multi component box beam. as shown in figure 9 [16]

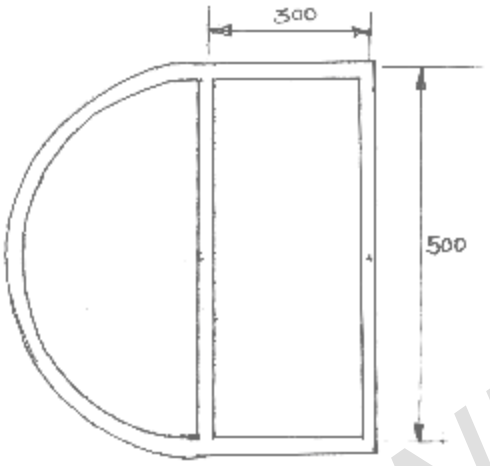

Figure 9:

8. Find the reactions at B and C of the continuous beam as shown in figure 10 by strain energy method. Draw B.M and S.F diagrams. EI is constant. [16]

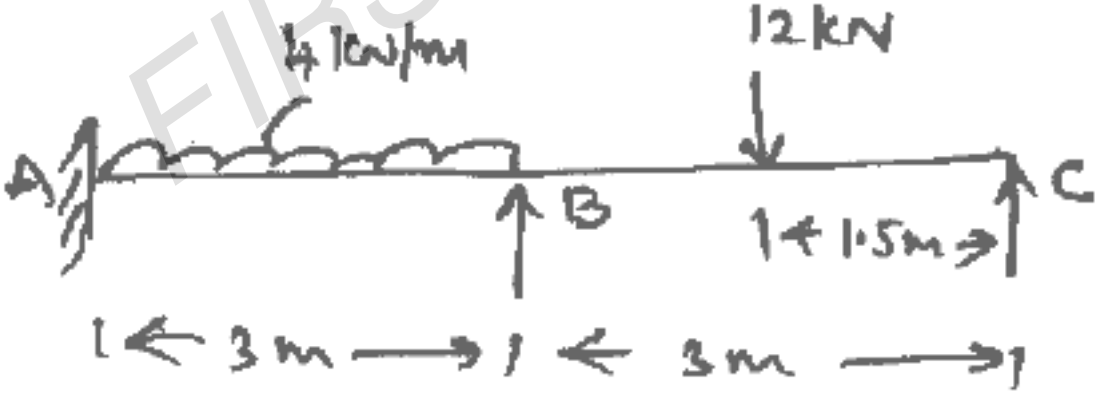

Figure 10:

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