Code No: R31211 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

AEROSPACE VEHICLE STRUCTURES-I

(Aeronautical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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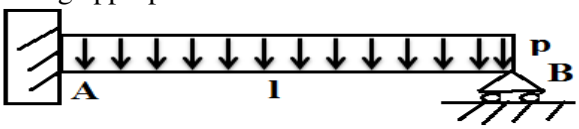
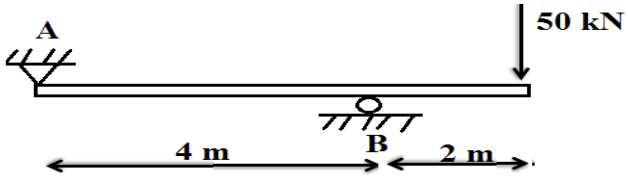
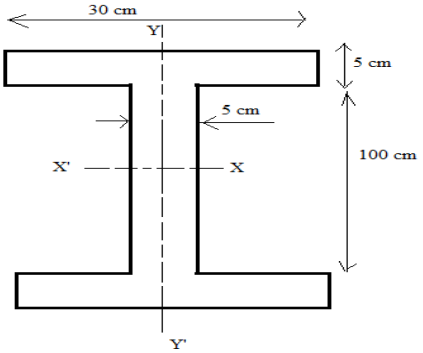
1. What is Redundancy and Do the complete redundant analysis for the following beam as shown below using appropriate method?



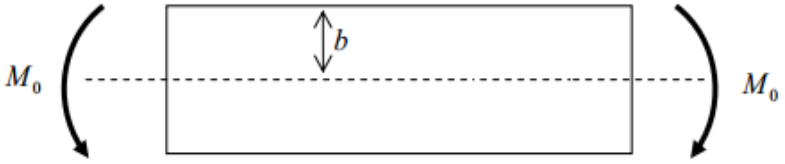
2. Determine the deflection under the load of the beam as shown below by Area Moment Method. E = 200 G Pa and I = 40 x 10^{-5} m^4.



3. (a) What is Euler's theory of buckling of columns? What are the assumptions of the Euler's theory?
   (b) A built up beam as shown below is simply supported at ends. Compute its length that when it is subjected to a load of 50 KN per meter length, it deflects by 1 cm, Find out the safe load if this beam is used in a column with both ends fixed. Assume factor of safety 2 and E = 210 G Pa.



4. Consider the bending of a rectangular beam by a moment M_0, as shown below. The length and sides of the rectangle are 2L, 2a and 2b respectively. Calculate the displacement of the beam along length width planes by assuming appropriate stress function and coordinate system.



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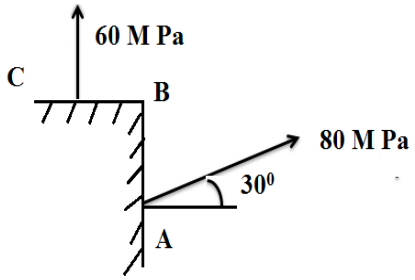
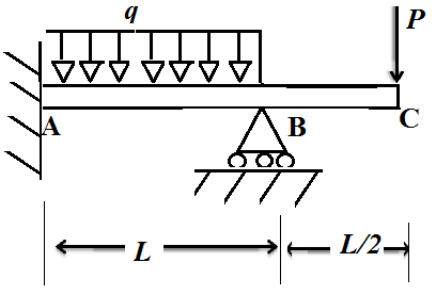
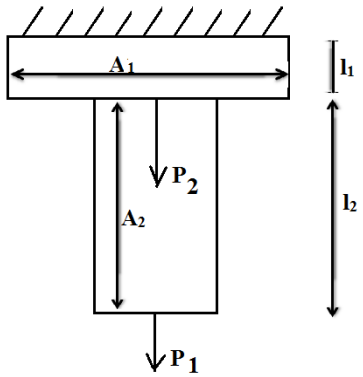
5. The intensity of resultant stress on a plane AB. as shown below, at a point a material under stress is 80 MPa (tensile) inclined at 30^0 to the normal plane. The normal component of stress on another plane BC at right angle to plane AB is 60 MPa. Determine (i) the resultant stress on plane BC, (ii) The principal stresses and the principal planes and (iii) the maximum shear stress and its plane.



6. A simple beam with an overhang supports a uniform load of intensity '*q*' on span AB and a concentrated load P at end C of the overhang as shown below. Determine the deflection at C, angle of rotation at C any energy principle?



7. Using displacement method, derive the expressions for the stresses displacements of the steel stepped rod shown below



8. A single monocoque box beam with length 'l' along Z- direction and the sides of the box 'a' and 'b' along X, Y axes respectively. Explain the shear flow distribution along the three directions if 'T' amount of torque is applied in XY plane at the free end of the cantilever box beam.

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Code No: R31211 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

AEROSPACE VEHICLE STRUCTURES-I

(Aeronautical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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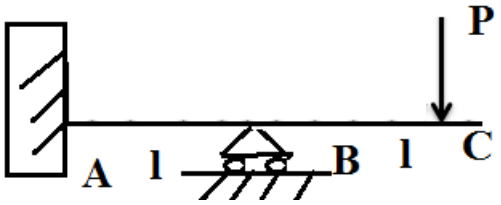
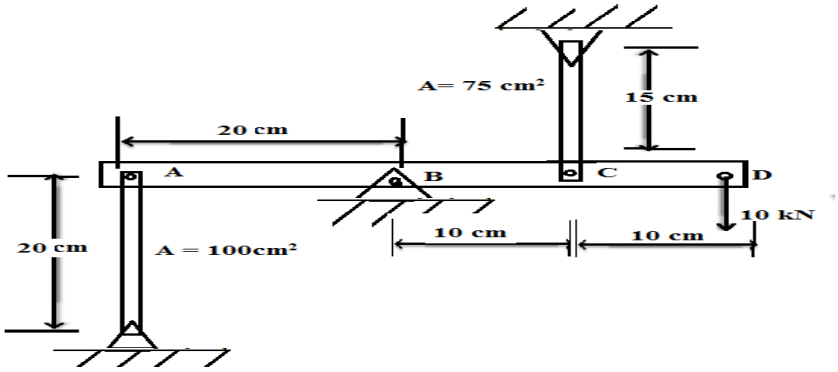
1. What is Redundancy and Do the complete redundant analysis for the following beam as shown below using appropriate method?



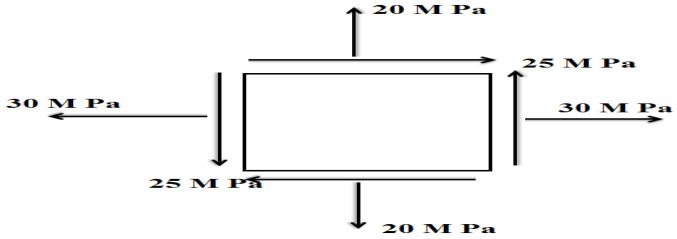
2. Derive the equations of equilibrium for a curved beam stress by taking appropriate example?

3. Derive the expression for equivalent length of a column, which is fixed at one end and hinged at other end? What is buckling factor? and derive Rankine's Formula?

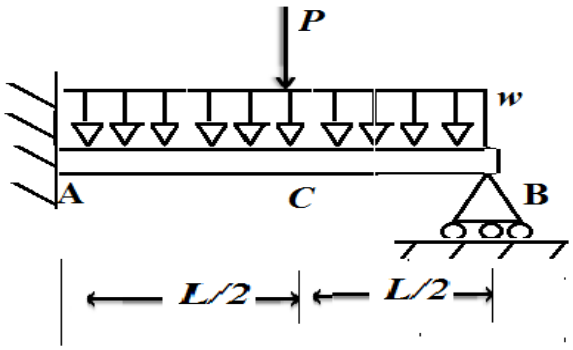
4. The two vertical aluminum rods that support the rigid bar ABCD are initially stress free as shown below. Determine the stress in each rod the application 10 kN load? Neglect the weight of the bar and use E = 70 G Pa.



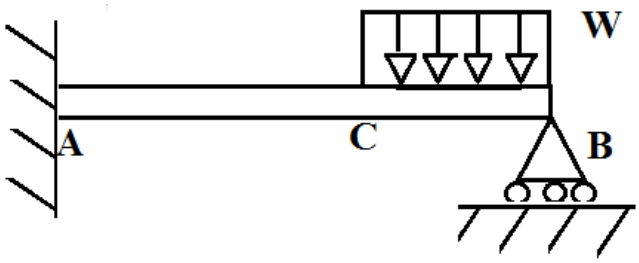
5. Figure shown below shows the state of stress at a point. Find the location of principal planes, principal stresses and maximum shear stress analytically and graphically.



6. A simple beam AB supports a uniform load of intensity w =10 kN/m and a concentrated load P = 25 kN as shown below. The load P acts at the midpoint C of the beam. The beam has a length L = 2.5 m. Modulus of elasticity E = 210 GPa and moment of inertia I = 31.2 x 10^2 cm ^{4}. Determine deflection at C, Using Castigliano's principle?



7. Using displacement method, derive the expressions for the stresses displacements of the steel beam with uniform cross section 'A' and lengths AC = L_1 and CB =L_2 as shown below



8. A double monocoque box beam, two boxes are arranged in along positive X axis with length 'l' along Z- direction and the sides of the each box 'a' and 'b' along X, Y axes respectively. Explain the shear flow distribution along the three directions if 'T' amount of torque is applied in XY plane at the free end of the cantilever box beam.

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Code No: R31211 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

AEROSPACE VEHICLE STRUCTURES-I

(Aeronautical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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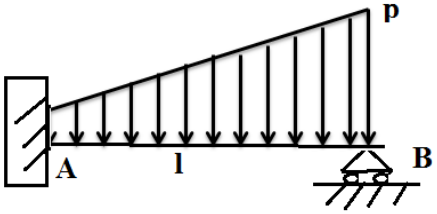
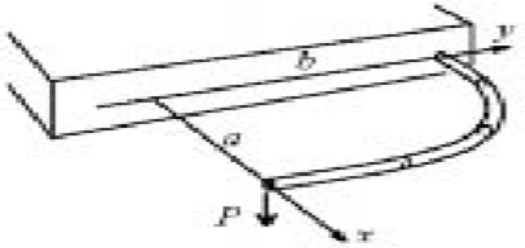
1. What is Redundancy and Do the complete redundant analysis for the following beam as shown below using appropriate method?

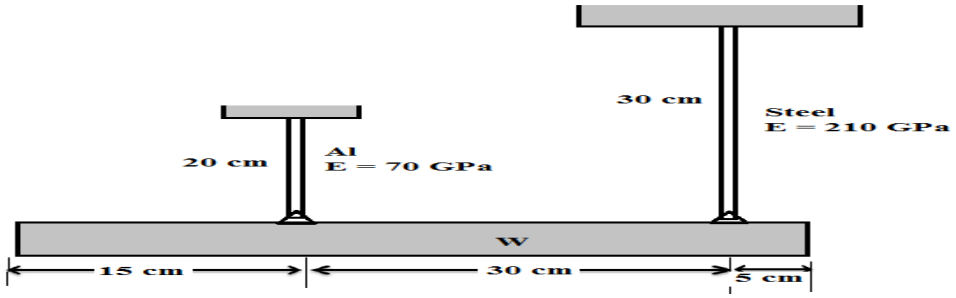


2. Write down the steps followed for finding the deflection a beam as shown below?

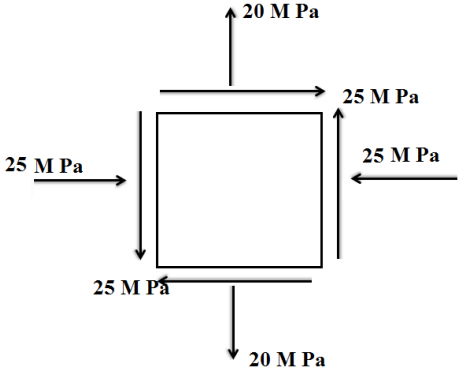


3. Compare the crippling loads given by Rankine's and Euler's formulae for tabular strut 25 cm long having outer and inner diameter of 2.5 mm and 2 mm respectively loaded through pin joints at both ends.
   Take yield stress as 315 MPa; a = 1/7500 and E = 200 G Pa. If the elastic limit for the material is taken as 200 MPa, below what length of the strut does the Euler formulae ceases to apply?

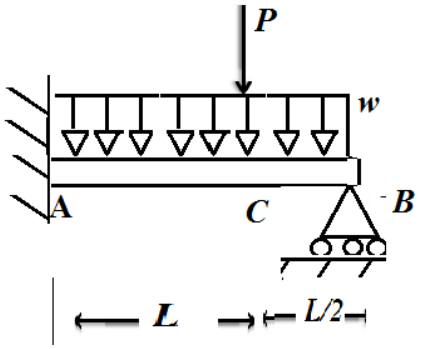
4. The uniform beam of weight W is to be supported by the two rods, the lower ends of which were initially at the same level. Determine the ratio of the areas of the rod so that the beam will be horizontal after it is attached to the rods. Neglect the deformation of the beam.



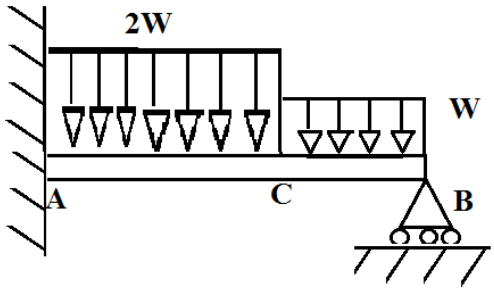
5. Figure shown below shows the state of stress at a point. Find the location of principal planes, principal stresses and maximum shear stress analytically and graphically.



6. A simple beam AB supports a uniform load of intensity w =10 kN/m and a concentrated load P = 25 kN as shown below. The load P acts at the C of the beam. The beam has a length L = 2.5 m. Modulus of elasticity E = 210 GPa and moment of inertia I = 31.2 x 10^2 cm ^{4}. Determine deflection at C, Using Castigliano's principle?



7. Using displacement method, derive the expressions for the stresses displacements of the body as shown below



8. Explain the Bredt-Batho formula? Explain the procedure for finding the shear flow along the cross section of cantilever beam under torque?

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Code No: R31211 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

AEROSPACE VEHICLE STRUCTURES-I

(Aeronautical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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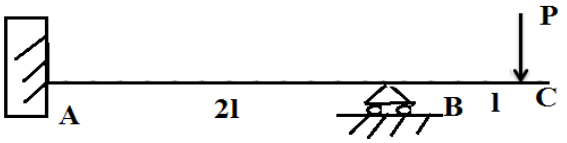
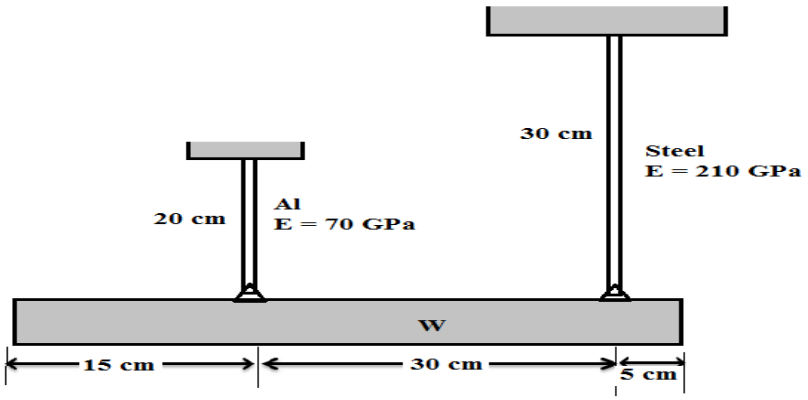
1. What is Redundancy and Do the complete redundant analysis for the following beam as shown below using appropriate method?



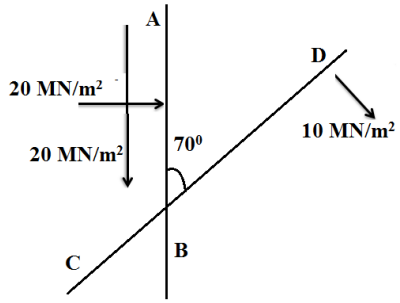
2. Derive the equations of deflections for a typical curved beam by taking appropriate example?

3. What are the assumptions and limitations of Euler's theory? And derive the expression for equivalent length of a column, which is fixed at both ends?

4. The uniform beam of weight W is to be supported by the two rods, the lower ends of which were initially at the same level. Determine the ratio of the areas of the rod so that the beam will be horizontal after it is attached to the rods. Neglect the deformation of the beam.



5. In figure shown below, AB and CD are two planes inclined to one another at 70 ^{0}. On the plane AB there is a compressive stress of 20 MN/ m^2 and a shearing stress of 20 MN/m^2, while on CD there is a tensile stress of 10 MN/m^2 and a shear stress. Determine shear stress, the principal stress and the position of principal planes.



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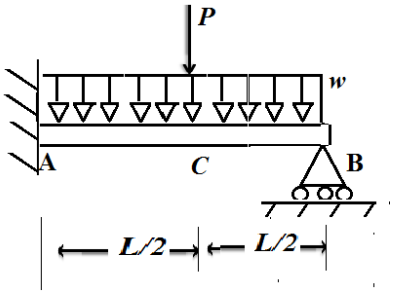
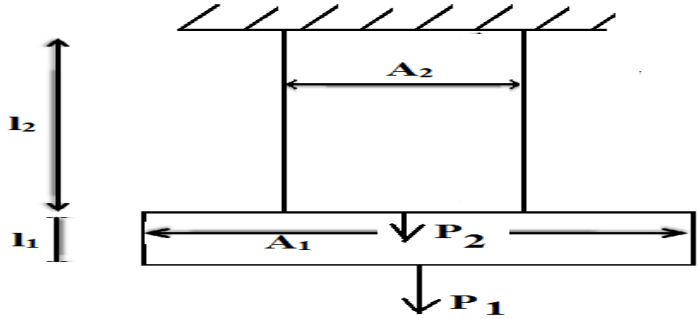


7. Using displacement method, derive the expressions for the stresses displacements of the steel stepped rod shown below



8. A single monocoque box beam with length 'l' along Z- direction and the sides of the box 'a' and 'b' along X, Y axes respectively. Explain the shear flow distribution along the three directions if 'T' amount of torque is applied in XY plane at the free end of the cantilever box beam.

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