Code No: 07A62102 **R07** **Set No. 2**

III B.Tech II Semester Regular/Supplementary Examinations,May 2010
Aerospace Vehicle Structures -II
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the effect of riveting a long flat plate to a stiffener at regular intervals, in terms of its buckling response.
   (b) Explain Nedham's method and Gerard's method of calculating crippling stress of extruded sections.
   (c) What are the various structural elements used in airplane fuselage? [5+6+5]
2. (a) Explain different types of wing structures.
   (b) Explain the advantages and disadvantages of different materials used for aircraft structures.
   (c) Explain Wagner's theory. [4+6+6]
3. The Unlipped extruded beam has the cross section shown in figure 1, determine:
   (a) The location of the shear centre.
   (b) The distribution of shearing stresses caused by a 110 KN vertical shearing force applied at O. [16]

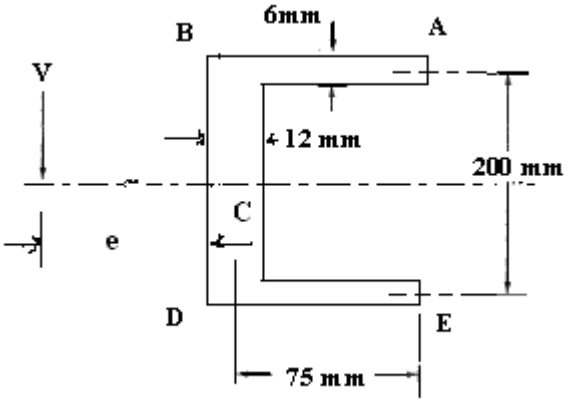

Figure 1:

4. The thin-walled section shown in Figure 2 is symmetrical about the x axis. The thickness to of the centre web 34 is constant, while the thickness of the other walls varies linearly from to at points 3 and 4 to zero at the open ends 1, 6, 7 and 8. Determine the St. Venant torsion constant J for the section and also the maximum value of the shear stress due to a torque T. If the section is constrained to twist

about an axis through the origin O, plot the relative warping displacements of the section per unit rate of twist.

[16]

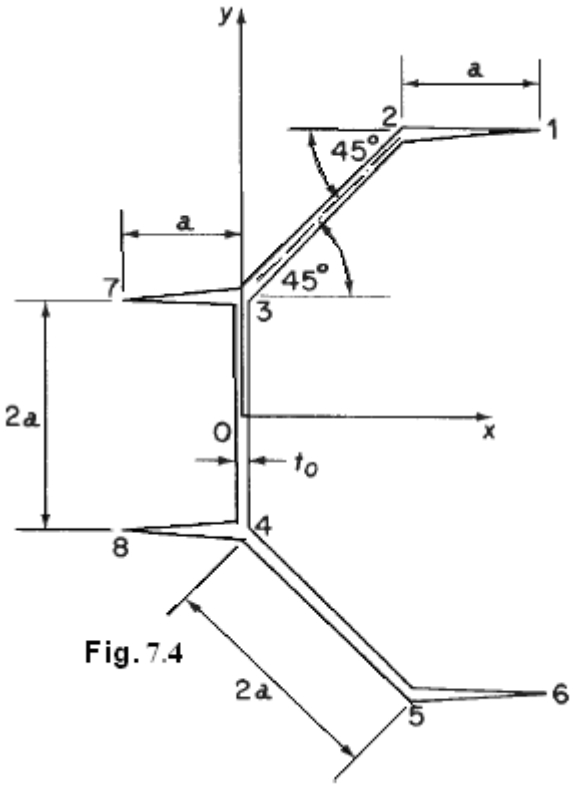

Fig. 7.4

Figure 2:

5. (a) Explain about torsion bending phenomena.

   (b) An open section beam of length L has the section shown in Figure 3 The beam is firmly built-in at one end and carries a pure torque T. Derive expressions for the direct stress and shear flow distributions produced by the axial constraint (the σ_Γ and q_Γ systems) and the rate of twist of the beam. [4+12]

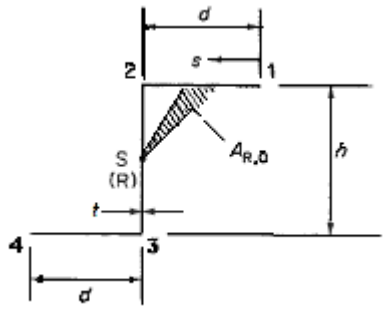

Figure 3:

6. What are the various forms of fuselage structures? Explain fuselage construction with the help of neat sketches? [4+12]

7. (a) what do you mean by plastic buckling of a flat sheet? Define L/ρ of equivalent column for different conditions.

   (b) Determine the buckling strength of a panel, comprising flat sheet and uniformly spaced stringers, a part of whose cross section is shown in figure 4, under uniform compressive loads. Take E=70GPa and compressive stress = 300 MPa. All dimensions are in mm. [6+10]

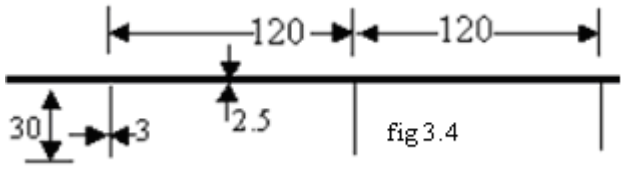

Figure 4:

8. Determine the shear centre for the circular section of radius R, thickness t having a naviour slit. [16]

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Code No: 07A62102 **R07** **Set No. 4**

III B.Tech II Semester Regular/Supplementary Examinations,May 2010
Aerospace Vehicle Structures -II
Aeronautical Engineering

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

Answer any FIVE Questions
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1. (a) Explain the effect of riveting a long flat plate to a stiffener at regular intervals, in terms of its buckling response
   (b) Calculate crippling stress for the given extrusion section. Assume E=75 GPa, Thickness of web is 1.5mm and thickness of flanges is 2mm. Shown in figure 1b. [6+10]

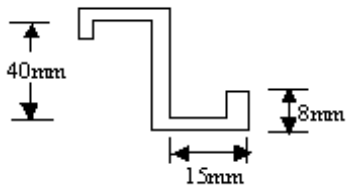

Figure 1b

2. What are the various types of wing structures? Show the construction with different types of stringers and web? [4+12]

3. Derive the expression for the total torque of 'I' section beam subjected to torsion With the help of neat sketches. [16]

4. (a) Derive an expression for the angle of diagonal tension.
   (b) Find the shear flow in each web of the beam shown in the figure 4b. Plot the distribution of axial load along each stiffening member when P_1=20kN and P_2=10kN. All dimensions are in cm. [6+10]

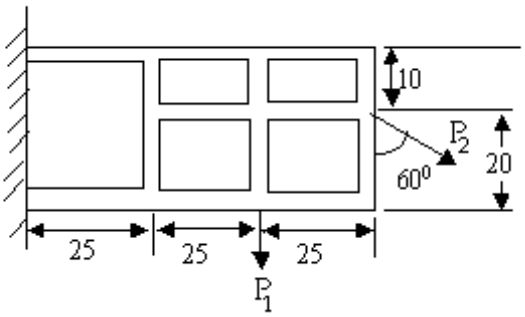

Figure 4b

5. (a) What is effective width of the sheet. Explain with neat sketches.
   (b) Explain plastic buckling of flat sheet with graphs and neat sketches and derive the expression for equivalent $L'/\rho = (\pi/\sqrt{3.62})s/t$

where L' = effective length . ρ= radius of gyration. S = distance between rivets along the direction of load application. t = thickness of the sheet. [4+12]

6. (a) What do you mean by shear centre? Explain with the help of neat sketch. Define shear flow? Explain the concept of shear flow in thin walled beams with the help of a neat sketch. [4+12]

7. Derive the expression for the total torque of Unlipped 'T' section beam subjected to torsion with the help of neat sketches. [16]

8. (a) Discuss the effect of torsion in open section beams and derive the equations for Shear stress distribution and the maximum shear stress due to applied torque.

   (b) Explain primary and secondary warping with the help of equations in terms of applied torque. [8+8]

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Code No: 07A62102 **R07** **Set No. 1**

III B.Tech II Semester Regular/Supplementary Examinations,May 2010
Aerospace Vehicle Structures -II
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A thin-walled cantilever beam of length L has the cross-section shown in Figure 5 and carries a load P positioned as shown at its free end. Determine the torsion bending constant for the beam section and derive an expression for the angle of twist θ_T at the free end of the beam. Calculate the value of this angle for P=100 N, a=30 mm, L =1000 mm, t =2.0 mm, E =70 000 N/mm^2 and G=25 000 N/mm^2. [16]

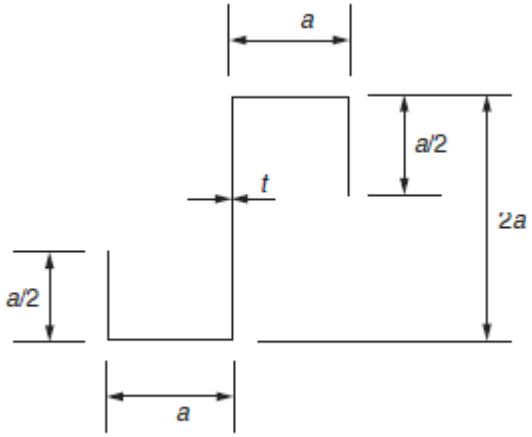

Figure 5:

2. Thickness of the I section is uniform of 10 mm. Determine the shear flow and shear force for the entire structure shown in figure 2. [16]

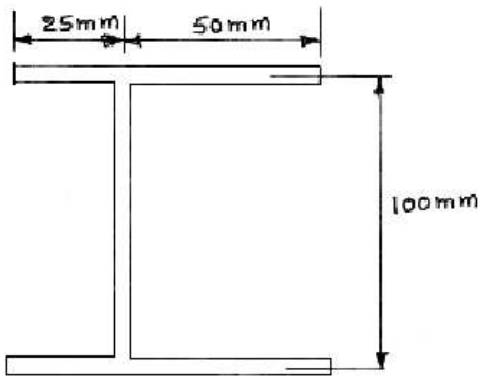

Figure 2

3. Write short notes on the following:
   (a) Effective walls & in effective walls.
   (b) Sheet wrinkling. [8+8]

4. (a) Derive an expression for the angle of diagonal tension.
   (b) Find the shear flow in each web of the beam shown in the figure 4b. Plot the distribution of axial load along each stiffening member when P_1=20kN and P_2=15kN. All dimensions are in cm. [6+10]

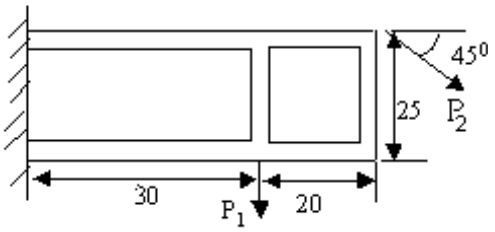

Figure 4b

5. A circular section with outer radius 25mm, inner radius 20mm, having small slit. Find out the shear center of the section due to vertical load applied at shear center. [16]

6. (a) Explain the effect of riveting a long flat plate to a stiffener at regular intervals, in terms of its buckling response.
   (b) The angle extrusion shown in figure 6b is loaded in compression. Each leg of the angle buckles as a plate simply supported on the ends and on one side and free on the other side. Find the stress, at which buckling occurs. If a sheet of 1mm thick is riveted to the extrusion by rivets spaced 25mm apart, find also the compression stress in the extrusion, which produces buckling of the sheet between rivets. Assume E_t = 55 GPa for the extrusion material and 37.5 GPa for the sheet material. All dimensions are in mm. [4+12]

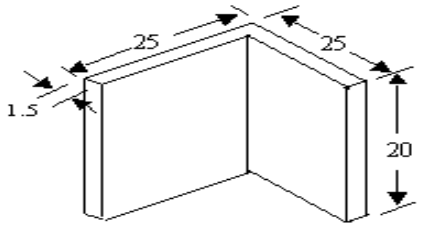

Figure 6b

7. (a) Explain buckling waves in a simply supported flat plate.
   (b) Determine the buckling strength of a panel, comprising flat sheet and uniformly spaced Z-section stringers, a part of whose cross section is shown in figure 6, under uniform compressive loads. [4+12]

8. Determine the rate of twist per unit torque of the beam section shown in Figure 7 if the shear modulus G is 25 000 N / mm^2. [16]

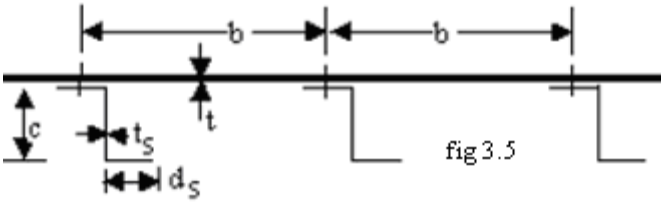

Figure 6:

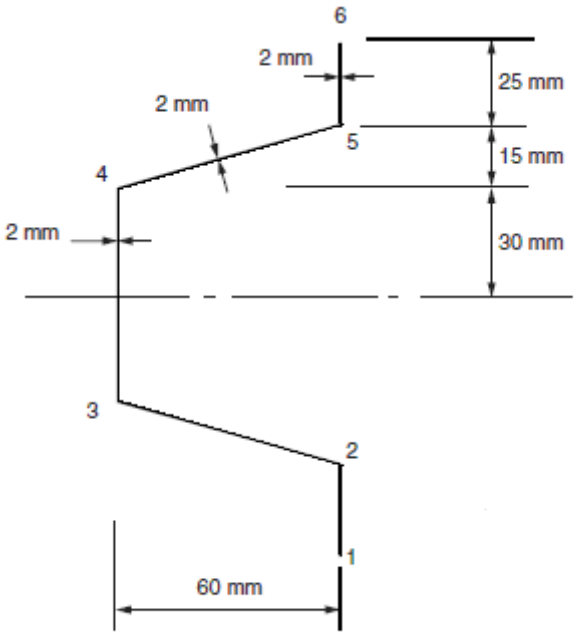

Figure 7:

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Code No: 07A62102 **R07** **Set No. 3**

III B.Tech II Semester Regular/Supplementary Examinations,May 2010
Aerospace Vehicle Structures -II
Aeronautical Engineering

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

Answer any FIVE Questions
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1. A cross section of a slit rectangular tube of constant thickness is shown in figure 1. Show that shear centre e= b(2h+3b)/2(h+3b). [16]

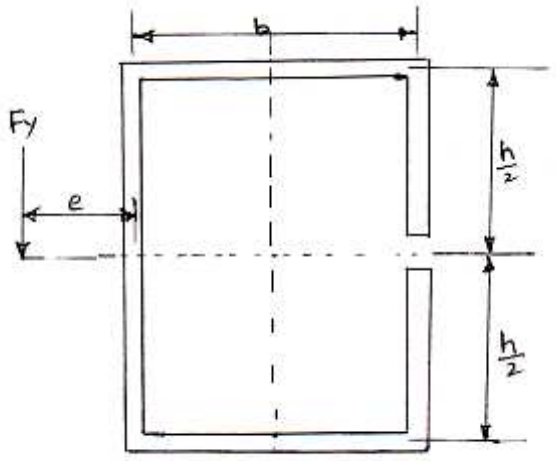

Figure 1

2. Unlipped channel shown in figure 8, subjected to 11KN load applied 100mm away the shear centre, which is producing Torque. Find out shearing stresses distribution and torque intensity. S= b= 100 mm, V=11 KN, t = 4 mm, h = 150 mm, e = 40 mm. [16]

3. (a) Explain critical crippling load for extruded sections and bent sheet sections.
   (b) Find crippling stress for the angle section shown in figure 3b, using Gerard's method. Assume necessary data. [6+10]

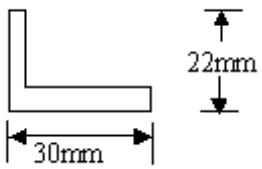

Figure 3b

4. Explain pure bending of thin plates and show that the deformed shape of the plate Is spherical and of curvature $1/\rho$ = M/[D(1+υ)] Where υ = poisons ratio, D is flexural rigidity, M is moment. [16]

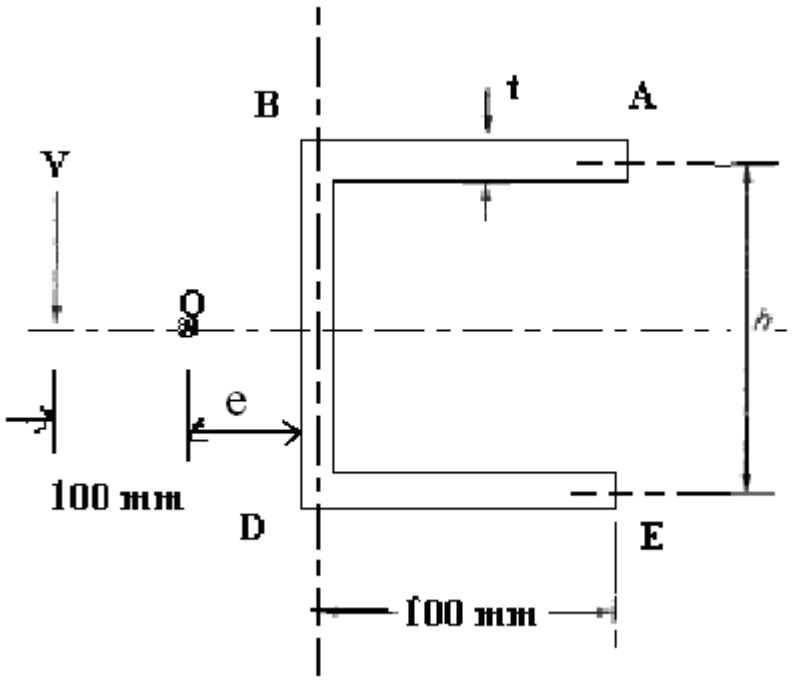

Figure 8:

5. Determine the maximum shear stress in the beam section shown in Figure 9 stating clearly the point at which it occurs. Determine also the rate of twist of the beam section if the shear modulus G is 25 000 N / mm^2. [16]

6. (a) Derive the relationship for shear force at any section of a tapered diagonal tension field beam, subjected to a load at its free end perpendicular to the axis in the plane of the beam.
   (b) Explain different types of structural members used in aircraft structures.
   (c) Explain different types of fuselage structures. [6+4+6]

7. What are the longorons, transverse stringers and span web? Explain their significance with the help of net sketches for wing and fuselage? [16]

8. An axially symmetric beam has the thin-walled cross-section shown in Figure 10 If the thickness t is constant throughout and making the usual assumptions for a thin-walled cross-section, show that the torsion bending constant ⌟R calculated about the shear centre S is $\lceil R = \frac{13}{12}d^5t$. [16]

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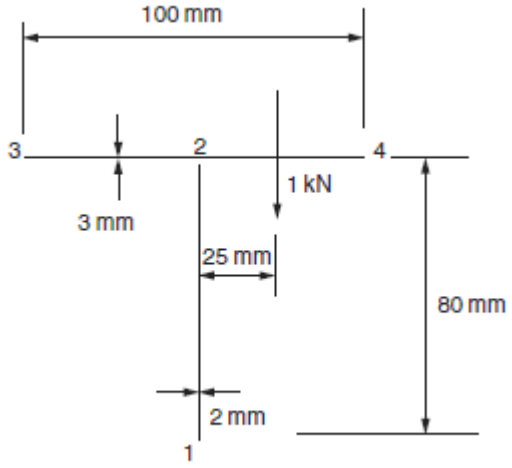

Figure 9:

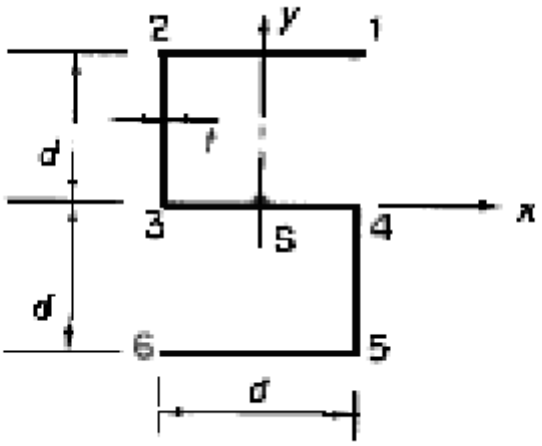

Figure 10: