Code No: RR322102 **Set No.1**

III B.Tech. II Semester Supplementary Examinations,
November/December -2005
AIRCRAFT STRUCTURES-II
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Derive the Equation for Bending stress in unsymmetric section about both the axes when it is subjected to moment M_z, M_y. Also locate the orientation of NA. [16]

2. Derive the Shear stress formula for a symmetric beam subjected to transverse shear force 'F'. [16]

3. Determine the shear centre for the circular section of radius R, thickness t having a navour shit. [16]

4. Explain the torsion of thin walled multicell structure section subjected to twisting. [16]

5. 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. Shown in Figure 1. [16]

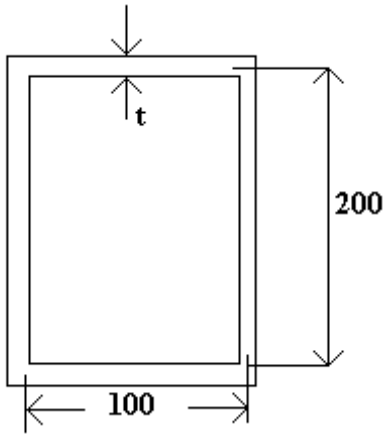

Figure 1:

6. Explain the various types of loads and supports on thin sheet and discuss the buckling phenomenon? [16]

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. Write short notes on the following: [16]

(a) Effective walls and ineffective walls

(b) Sheet wrinkling.

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Code No: RR322102 **Set No.2**

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

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1. Derive the Equation for principle moment of inertia for unsymmetrical section about both axes. If I_x, I_y are M.I. about the centroidal axes and I_{xy} is the product of inertia. [16]

2. Define shear flow? Explain the concept of shear flow in thin walled beams with the help of a neat sketch. [16]

3. (a) Explain what do you mean by shear centre.
   (b) Prove that the shear centre lies at the junction for an angle section with equal legs. [6+10]

4. Derive the equation for Torque and angle of twist for two cell closed section. Also calculate the total strain energy stored. [16]

5. b =300
   t_1 =20
   $t_2 = t_3$= 10
   Determine the location of the shear centre for the cross-section. All dimension are in mm. Shown in Figure 2 [16]

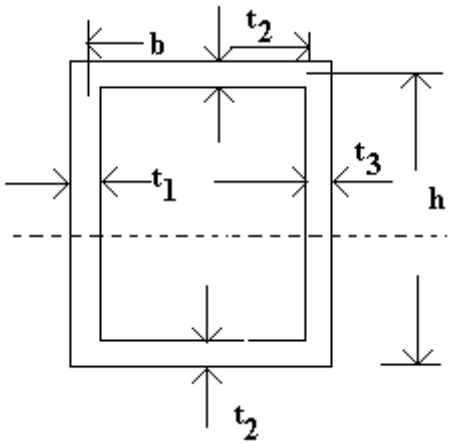

Figure 2:

6. A sheet panel is 75 - 230- 1.3 mm size. Consider all sides as simply supported. Determine the buckling load if the normal compressive load is applied normal to the 75mm sides. Do so for 3 different materials. [16]

(a) Al alloy 70 75 T6

(b) Magnesium HK31A

(c) Titanium Ti-8Mn

7. Explain in detail the stresses in the fuselage components due to air loads? [16]

8. Write short notes on the following: [16]

(a) Unsymmetrical bending

(b) Neutral axis.

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1. Show that, if a solid rectangular beam is bent by a couple applied in a plane containing one diagonal of the rectangular cross-section, the neutral axis will lie along the other diagonal. [16]
2. Derive the equation for shear flow in the flange and web of thin walled I-section. Plot the shear flow variation. [16]
3. Explain the concept of provided stringers in craft structures with the help of neat sketches. [16]
4. Explain the torsion of thin walled closed tubes subjected to twisting with the help of a neat sketch. [16]
5. Uniform thickness t=5mm Determine the Shear Centre for an air craft box beam shown in Figure 3. [16]

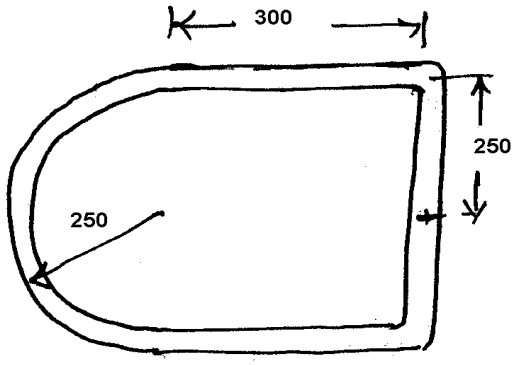

Figure 3:

6. A sheet panel is 100mm - 250mm - 1.2mm Determine the buckling load if all edges were clamped and compression load is applied normal to 100mm side. [16]
7. Explain in detail the stresses in the wing section due to air loads? [16]
8. Write short notes on the following: [16]
   (a) Shear lag
   (b) Torsion of thin walled members.

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Code No: RR322102 **Set No.4**

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

Answer any FIVE Questions
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1. Find the Centroid, Moment of inertia about both centroid and Product of inertia for the unsymmetrical section shown in Figure 4. .

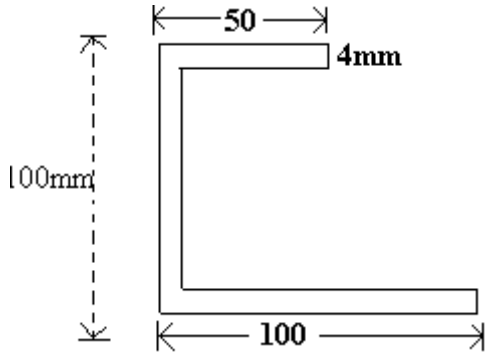

Figure 4:

thickness is uniform t = 4 mm. [16]

2. Derive the equation for shear flow in unsymmetrical section about the axis with the help of a neat sketch. [16]

3. Determine the moment of inertia, shear flow and shear centre for a semi circular ring of radius R, uniform thickness t subjected to transverse shear force normal to symmetrical centroidal axis. [16]

4. Derive the Bredt- Batho formula related to torsion. What are the assumptions made? [16]

5. t=3mm uniform locate the shear centre for the aircraft box beam. Shown in Figure 5. [16]

6. A sheet panel 125mm - 320mm - 12mm has all edges simply supported. The panel is subjected to compression loads, which produce compressive stresses of 1700 N/cm^2 applied normal to 125mm side. Will the sheet buckle under the given load system if made of Al alloy 2024-73 material. What is the margin of safety? [16]

7. What are the classification of aircraft loads? Explain the stresses due to air loads in detail? [16]

8. Write short notes on the following: [16]

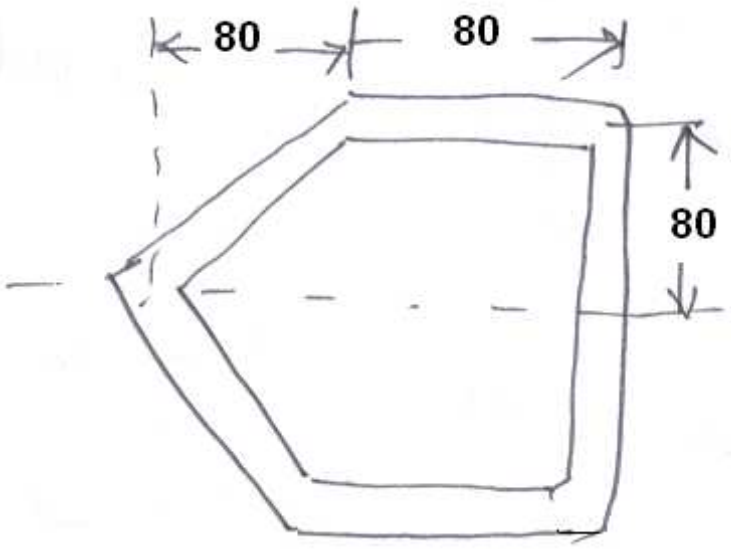

Figure 5:

(a) Sketch tapered wing and fuselage

(b) Sketch the shear flow variation over the symmetrical wing and fuselage.

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