Register Number……

B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Fifth Semester

AERONAUTICAL ENGINEERING

U07AR501: Aircraft Structures – II

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 × 1 = 10 Marks)

1. An example for single axis symmetry is
   (a). Right angled triangle (b). Circular section
   (c). Trapezoidal section (d). Angle section

2. A prismatic beam has
   (a). Uniformly varying cross section (b). Same cross sectional area with warping
   (c). Random cross section (d). Same cross sectional area without warping

3. Plates made to carry only in – plane axial loads are called
   (a). Bar elements (b). Beam elements
   (c). Membrane Elements (d). Truss elements

4. Deflections of the thin – walled structures are primarily due to
   (a). Shear strains (b). Bending strains
   (c). Shear force (d). Axial force

5. For a thin – walled channel section, the shear centre location
   (a). is always within the section and close to the centroid
   (b). always lies outside the section
   (c). is not necessarily within the section
   (d). lies only at the free end of the section

6. In lumping a cross – section, the booms are assumed to carry only ---------- and the skin resists only ----------.
   (a). Shear stress, Bending stress (b). Shear stress, buckling stress
   (c). Buckling stress, Shear stress (d). Bending stress, Shear stress

7. The tubes will not warp under torsion are called
   (a). Single cell tubes (b). Multi – cell tubes
   (c). Neuber tubes (d). All the above

8. Which one of the following is a stiffener member
   (a). Bulk heads (b). Rings
   (c). Stringers (d). All the above

9. In the concept of Effective width, If the skin and stiffener made of different materials then Crippling can occur

   (a). Above the Proportional limit (b). Below the Proportional limit

   (c). After the Fracture Point (d). Before the yield Point

10. The strength of the extruded sections can be modified by using

   (a). Rivets (b). Bolts

   (c). Lips and Bulbs (d). Panels

PART B (10 × 2 = 20 Marks)

11. What is Antisymmetric property?

12. What is prismatic beam? Give an example.

13. Define Principal axis.

14. Define Shear centre.

15. Differentiate between shear and couple.

16. State the Castigliano's First theorem.

17. What is Shear Lag?

18. Sketch the buckling modes for local buckling and global buckling.

19. What are the important factors that govern the selection of an aircraft material?

20. What is the function of ribs in the wing construction?

PART C (5 × 14 = 70 Marks)

21. (a). Derive an expression to find the bending stress at any location of the beam section by K – Method? (14)

(OR)

(b). A box beam with 50 cm length is subjected to loads P_X = 30 KN and P_Y = 20 KN as shown in the figure 1 (b). The stringer areas are a = b = 4 cm^2, d = e = 3 cm^2, c = f = 2 cm^2. Find the maximum bending stress. (14)

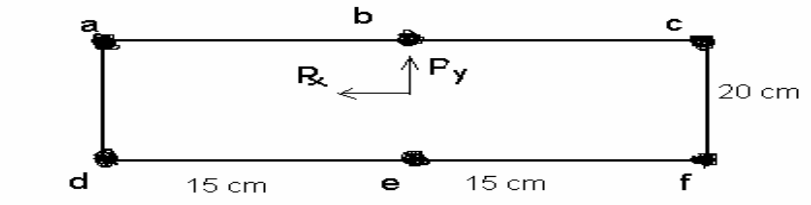

Figure 1 (b)

22. (a). Find the Shear Center for the section shown in figure 2 (a). (14)

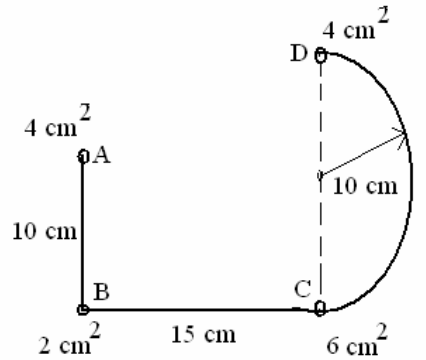

Figure 2 (a)

(OR)

(b). Determine the shear flow distribution of I – section, where the walls are effective in bending shown in the figure 2 (b). Thickness‘t’ is constant. Assume the vertical shear load is acting downwards. (14)

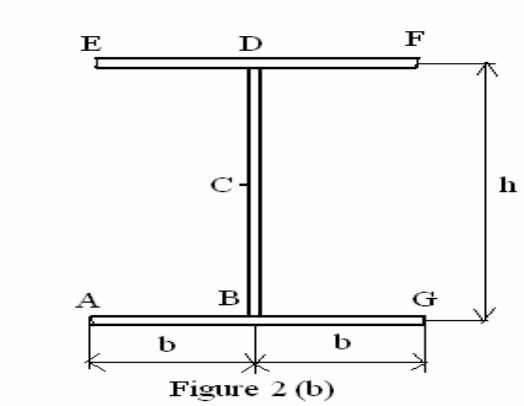

Figure 2 (b)

23. (a). Compare the maximum shear stress in a circular tube (Refer fig 3(a)) as calculated from the equation $\tau = \frac{T}{2tA}$ for a thin – walled tube with the stress calculated from the torsion formula. Justify your answer. (14)

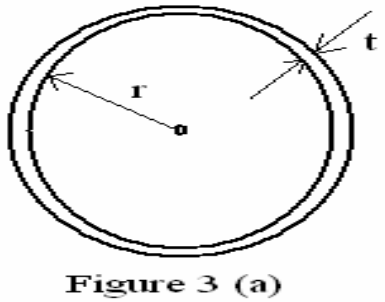

Figure 3 (a)

(OR)

(b). A multi cell structure shown in figure 3 (b) is subjected to clockwise torque of 1000 N – m. Compute the shear flow in the cell structure and the associated twist. t = 3 mm everywhere. (14)

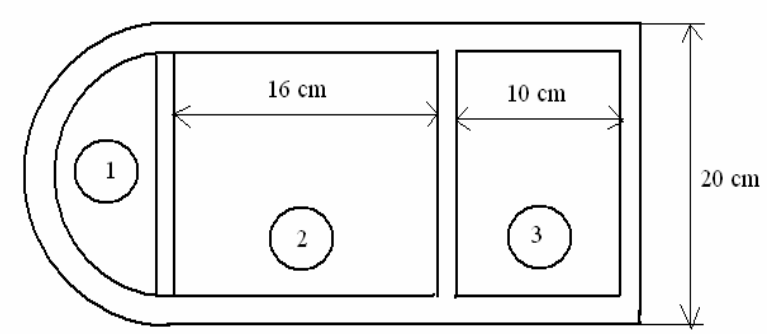

Figure 3 (b)

24. (a). Derive the differential equation governing the buckling of a thin flat plate. (14)

(OR)

(b). Obtain the compressive load taken by the sheet with stiffners – stringer combination panel for the following conditions shown in figure 4 (b),

(i). When the sheet buckles first

(ii). When the stringer stress is 75 Mpa.

Assume E= 70 Gpa, Each stringer has an area of 1.25 cm^2.

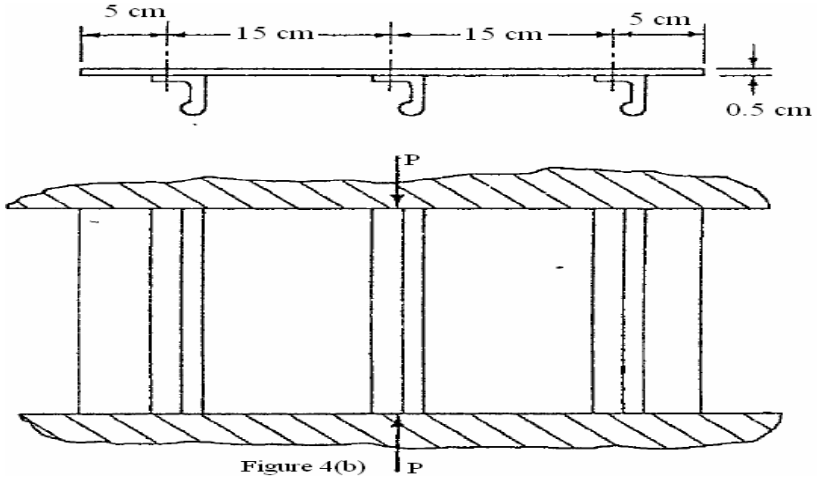

Figure 4(b)

25. (a). Explain the complete and Incomplete Tension Field Beams. (14)

(OR)

(b). Explain in Detail about the structural Idealization of wings. (14)

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