Code: 9A21704

R09

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013
STRUCTURAL ANALYSIS & DETAILED DESIGN
(Aeronautical Engineering)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1.   List out and explain the properties of the engineering materials for design of an aircraft in detail.

2.   Discuss resistance to lightning strike skin penetration and wing layout.

3.   Explain current landing gear design of:
    (a) Boeing B747.
    (b) Lock head C-5.
    (c) C-141.
    (d) Fighter airplane landing gear.

4. (a) How the structural idealization is help full for analysis of structures?
    (b) Part of wing section is in the form of the two-cell box shown in Figure 3.2 in which the vertical spars are connected to the wing skin through angle sections all having a cross-sectional area of 300 mm^3. Idealize the section into an arrangement of direct stress carrying boom and shear stress only carrying panels suitable for resisting bending moments in a vertical plane. Position the booms at the spar/skin junctions.
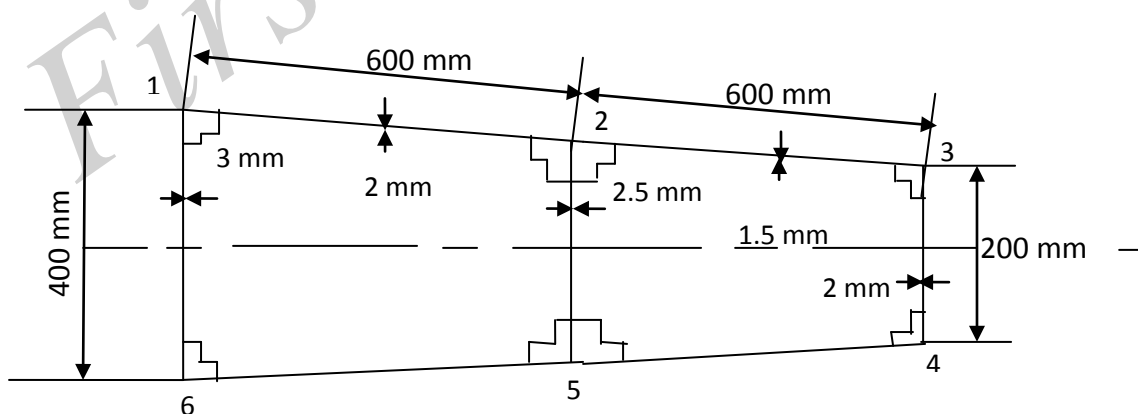

Figure 3.2

Contd. in page 2

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5. A 762 mm radius circular cross-section fuselage having 0.8 mm skin thickness and 16 numbers of stringers are equally placed around the circumference. The stringers number 1 and 9 are placed on y axis, number 5 and 13 are placed on x-axis. The cross-sectional area of each stringer is 100 mm^2 and the vertical distances from mid line of the section wall to stringer number (1) is 381.0 mm, (2) and (16) is 352.0 mm, (3) and (15) is 269.5 mm, (4) and (14) is 145.8 mm. If the fuselage is subjected to a bending moment of 250 kNm applied in the horizontal plane of symmetry at this section. Calculate the direct stress distribution.

6. Explain how to design landing gear brace struts by using theories of failures.

7. (a) Explain reliability engineering concepts.
  (b) What is mean by design for reliability? Explain.

8. A thin cylindrical shell 2.5 m in diameter is composed of plates 12.5 mm thick. The yield stress of for the material is 300 N/mm^2. Calculate the internal pressure which causes yielding according to the following theories of failure.
  (a) Maximum shear stress.
  (b) Maximum strain energy.
  (c) Maximum shear strain energy. Poisson's ratio = 0.25.

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