Code.No: 37152 | R05 | SET-4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV .B.TECH – I SEM REGULAR EXAMINATIONS JANUARY- 2010
STRUCTURAL ANALYSIS AND DETAILED DESIGN
(AERONAUTICAL ENGINEERING)

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

Answer any FIVE questions
All questions carry equal marks

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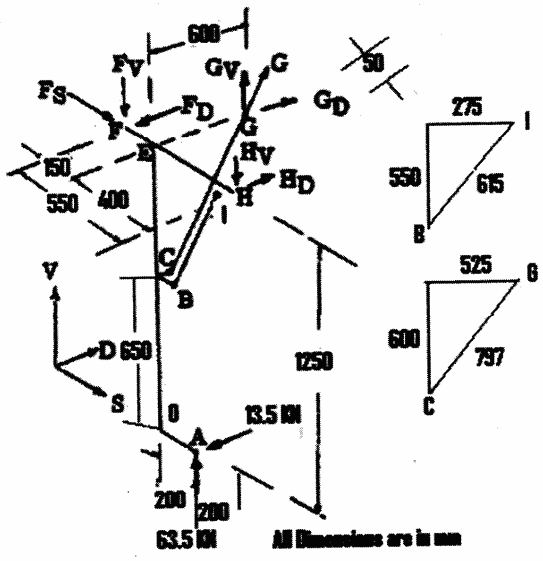
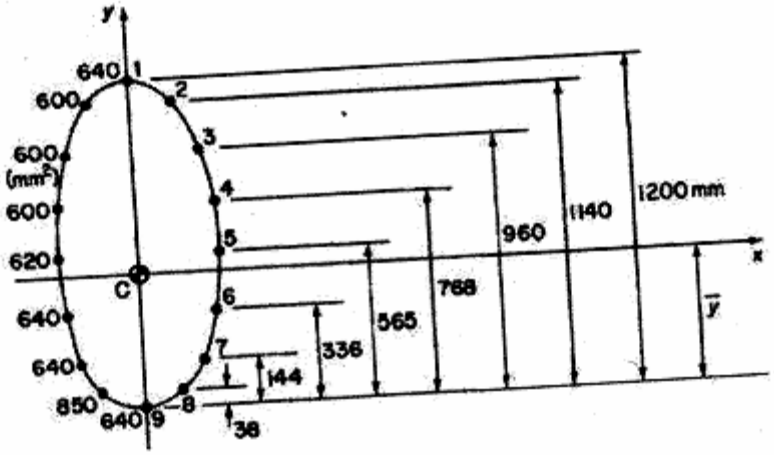
1. Tricycle type of landing gear shown in fig.



Find the forces Gv, Fv, Hd, Fd, Hv of brace struts. Assume the data if necessary. [16]

2. What is effective sheet thickness and effective area of stringer type of fuselage section? Explain with the help of neat sketches. [16]

3. The fuselage as shown in fig. is subjected to a bending moment of 100kN-m applied in the vertical plane of symmetry. If the section had been completely idealized into a combination of direct stress carrying and shear stress only carrying panels, determine the direct stress in each boom. [16]



4. a) Explain about buckling short cylinders, intermediate cylinders, long cylinders and very long cylinders. [16]

b) Discuss buckling of monocoque circular cylinder under axial load and internal pressure.

5. a) Explain buckling of a monocoque circular cylinder under external hydrostatic pressure

b) Monocoque cylinder radius (r) = 1500mm, thickness t = 1.4mm, length L = 2200mm, μ = 0.3. Torsional buckling co-efficient (K_t) = 180. Find the geometrical parameter (Z) and what torsional moment will this cylinder develops. [16]

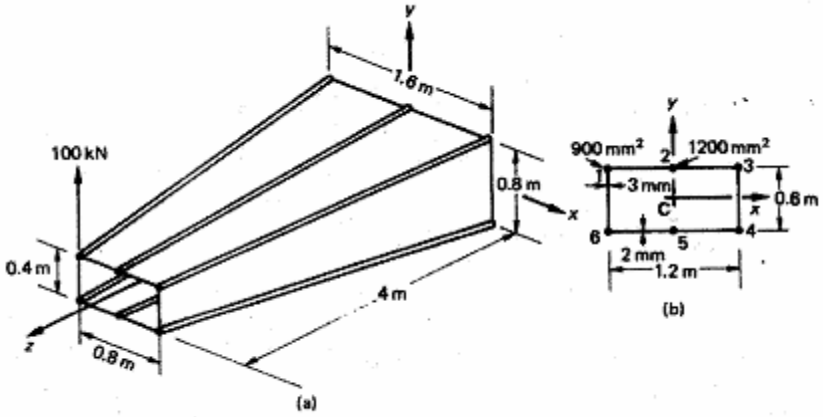
6. a) Derive the approximate formula for semi-tension field beam

b) A 50mm by 2.4mm steel tube is heat treated to a 6 + ultimate tensile strength $\sigma_{tu} = 1240 N/mm^2$

i) Find the margin of safety if the tube resists a design tension load of 22000N and a design bending moment of 3.3 kN-m.

ii) Find the margin of safety if the tube resists a bending moment of 3.3KN-m and a torsional moment of 5.64KN-m. Assume $\sigma_B = 1466 N/mm^2$ and the ratio $\frac{\tau_T}{\sigma_{tu}} = 0.58$. [16]

7. The cantilever beam shown in figure is uniformly tapered along its length in both X and Y directions and carries a load of 100k N at its free end. Calculate the forces in the booms and shear flow distribution in the walls at a section 2m from the built in end if the booms resist all the direct stresses while the walls are effective only in sheer. Each corner boom has a cross-sectional area of 900 mm^2 while both central booms have cross-sectional area of 1200 mm^2. [16]



8. Explain the theories of failure in structural design. [16]

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