Fifth Semester B. Tech Degree Examination, November 2015
Branch: Aeronautical Engineering
Model Question Paper
(2013 Scheme)

13.504 AIRCRAFT STRUCTURES- II (S)

3Hrs 100 Marks

PART A

Answer all questions.

1. Define principal axis and neutral axis and give an expression to determine them.
2. For a structure which primarily carries bending loads why is I-section preferred to other sections?
3. Differentiate between symmetric bending and asymmetric bending.
4. A thin walled section of 8 cm radius and wall thickness 2mm is subjected to a torque of 24.0 kNm. Sketch the shear flow pattern.
5. Find the expression for shear flow in a circular tube subjected to shear through its center.
6. Draw the bending stress and shear stress distribution for a C-section.
7. What is buckling and crippling stress?
8. Explain with sketch a semi-monocoque wing and fuselage and state he assumptions made in the analyses.
9. Specify any one aluminum alloy used in aircraft construction and its properties.
10. Explain the difference between plate buckling and column buckling.

10 X 2=20 marks

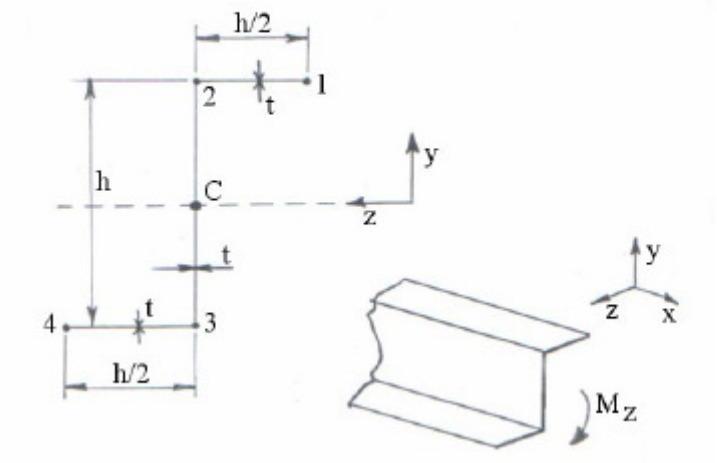
PART B

(Answer one full question from each module)

MODULE I

11.

Derive the bending stress relation for the Zee section shown below.

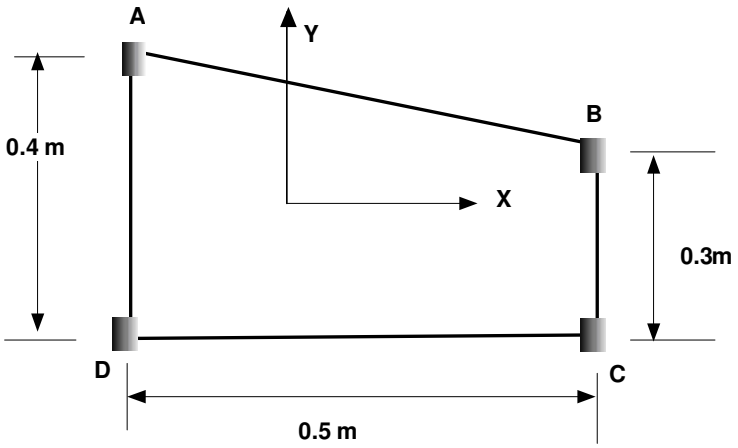


OR

12.

Consider the 4-stringer single box-beam section shown and assume negligible contribution of thin walls to bending resistance.

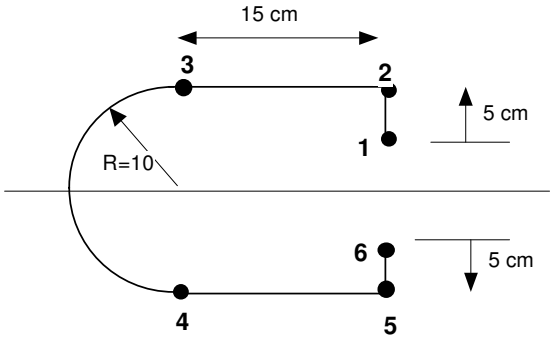
A1= 6 x 10-4 m2, A2 = 5 x 10-4 m2, A3 = A4 = 4 x 10-4 m2



The above cantilever section is acted upon by two forces 10 kN along the Y-axis and 5 Kn along the x-axis at a distance of 1m from the fixed end. Determine the maximum bending stress in the boom stringers and the inclination of the neutral axes.

MODULE-II

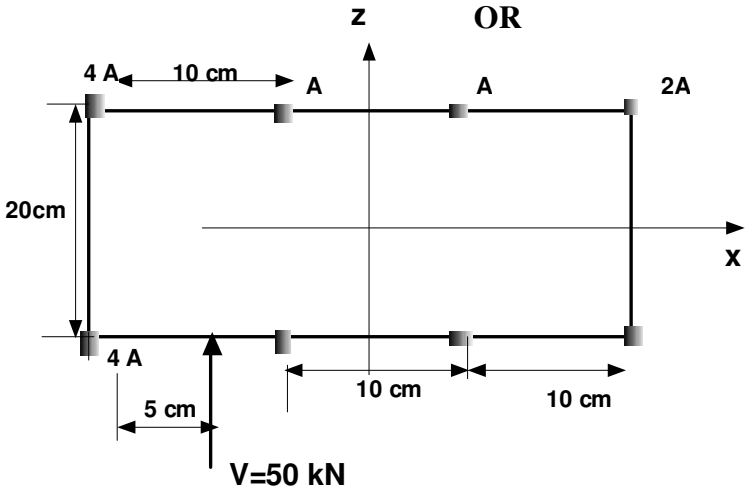
13 Find the shear flow distribution and locate the shear center location for the section shown below, for an vertical load Sy =50 kN load through shear center.



AREA OF STRINGERS ALL EQUAL 4CM^2

14.

OR



Obtain the shear flow distribution around a closed section subjected to a shear load V=50kN as shown in figure below. Stringer areas A= 6.24 sq. cm.

MODULE-III

15. **A)** Explain in detail the Needham and Gerard methods of finding the failure strengths of open and closed sections subjected to compressive loads. **10 Marks**

B) Obtain the expression for critical stress value for a sheet under compression with simply supported loaded edges and free unloaded edges. **10 Marks**

OR

16. **A)** Explain how the crippling the crippling stress is computed for a composite section? **10 Marks**

B) Compute the crippling stress for the ZEE section which has a flange length of 8 cm and a depth of 8 cm.. E=70GPa, effective width is 100 cm. Thickness is constant throughout the section and is equal to 2mm. **10 Marks**

MODULE-IV

17. **A)** What are the loads that an aircraft wing is subject to? What are the structural components contained in an aircraft wing? **10 Marks**

B) Explain the construction of the Shrenk's curve and hence draw the shear force and bending moment diagrams for a cantilever wing. **10 Marks**

OR

18. Write short notes on (ANY FOUR)

i) Tension field and shear resistant beams.
ii) Stresses in ribs
iii) Square sheets require least load for buckling
iv) Sandwich structures.
v) What do you understand by idealization in structural analyses?
vi) Explain the procedure to find the shear and bending moment distribution in a fuselage structure

20 x 4 = 80 marks