Question Paper Code : 91030

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Aeronautical Engineering

AE 2302/AE 52/AE 1302/10122 AE 502 — AIRCRAFT STRUCTURES — II

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the importance of shear center.

2. What is the difference between symmetric and unsymmetric bending?

3. What is shear flow?

4. A multi-cell structure subject to pure torque is statically indeterminate. Why?

5. Define Shear center and Elastic axis.

6. Write the expression for shear flow in a single cell tube under torque.

7. Derive the buckling equation for a thin plate.

8. Define crippling strength.

9. List out the various structural elements within an aircraft wing with their functions.

10. What is a Wagner beam?

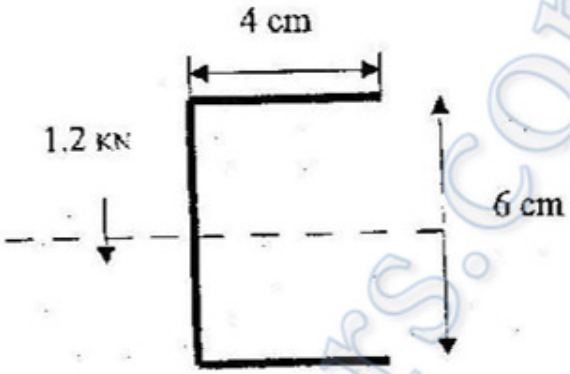
PART B — (5 × 16 = 80 marks)

11. (a) Find the bending stress distribution in a thin walled Z section whose thickness is t, height h, flange width h/2 and subjected to a positive bending moment Mx.

Or

(b) Derive and obtain an expression for the bending stress in an unsymmetrical section subjected to bending using 'neutral axis' method.

12. (a) Plot the shear flow distribution and find the shear centre for the section below. Thickness = 2 mm.

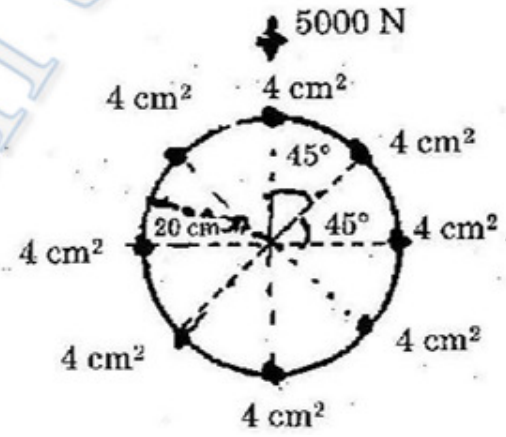


Or

(b) (i) Derive an expression for shear flow of an open tube of arbitrary cross section subjected to shear loads Sx and Sy without twist. (11)

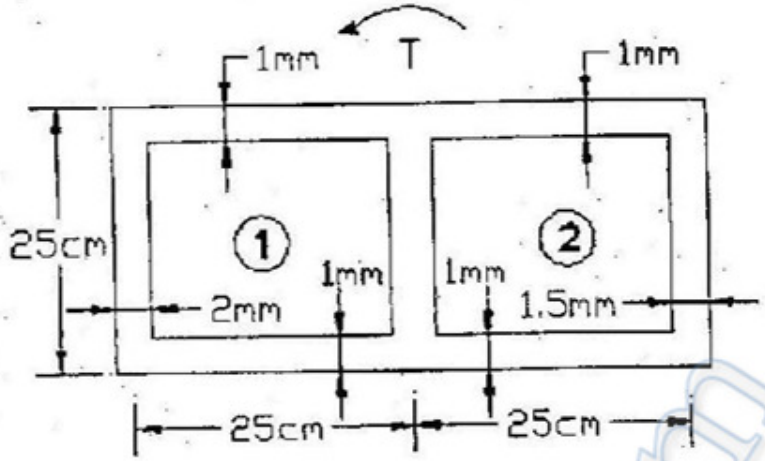
(ii) Modify the above expression for a closed tube. (5)

13. (a) Find the shear flow in all the webs of the closed single cell shown in fig. under a vertical load of 5000 N. Area of each boom is 4 cm².



Or

(b) Find the shear flow and twist per unit length of the two cell tube made of aluminium as shown in figure and subjected to a torque 75000 Ncm.



14. (a) Explain the Needham's and Gerard's methods of determining crippling stresses. Derive appropriate equation.

Or

(b) (i) Differentiate between buckling and crippling and explain any one method to determine crippling strength. (8)

(ii) Explain the pure tension field and semi tension field beam analysis and bring out their differences. (8)

15. (a) (i) Draw the shear force and bending moment diagram for a typical semi cantilever wing. (8)

(ii) Explain the effect of non parallel flanges in a beam with suitable examples. (8)

Or

(b) (i) What are the various loads that an aircraft fuselage and wings are subject to? (4)

(ii) What is V-n Diagram? Explain how will you plot v-n diagram for a passenger aircraft with the help of necessary equations. Also explain the importance of v-n diagram in aircraft structural design. (12)