



B.E DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Fifth Semester

AERONAUTICAL ENGINEERING

U18AEI5202: Aircraft Structures – II

COURSE OUTCOMES

CO1: Analyze the response of structures due to unsymmetrical bending.

CO2: Analyze bending, shear and torsion of open and closed thin-walled sections.

CO3: Analyze the failure modes occur in thin-walled plates structures.

CO4: Analyze behavior of aircraft structural components under various types of loads.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

- | | | |
|--|-----|-------------------|
| 1. How unsymmetrical bending occurs in a rectangular beam? | CO1 | [K ₁] |
| 2. Write down the methods for finding the bending stress for the unsymmetrical section | CO1 | [K ₂] |
| 3. Draw the shear flow diagram for Z section beam subjected to bending. | CO2 | [K ₁] |
| 4. Write the Procedure for solving multicell tube subjected to a torque. | CO2 | [K ₂] |
| 5. Whether a multi cell structure subjected to torque is statically determinate or indeterminate. Why? | CO2 | [K ₁] |
| 6. Define Neuber beam. | CO2 | [K ₁] |
| 7. What are the possible modes of failure of sheet stiffener panels? | CO3 | [K ₂] |
| 8. Differentiate between primary and secondary buckling. | CO3 | [K ₂] |
| 9. List out the functions of an aircraft stiffeners. | CO4 | [K ₁] |
| 10. Define Sheet wrinkling failure. | CO4 | [K ₁] |

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

- | | | | |
|---|----|-----|-------------------|
| 11. Figure 1 shows the section of an angle purlin. A bending moment of 3,000 Nm is applied to the purlin in a plane at an angle of 30° to the vertical y axis. If the sense of the bending moment is such that both its components M _x and M _y produce tension in the positive xy quadrant, calculate the maximum direct stress in the given section. | 16 | CO1 | [K ₄] |
|---|----|-----|-------------------|

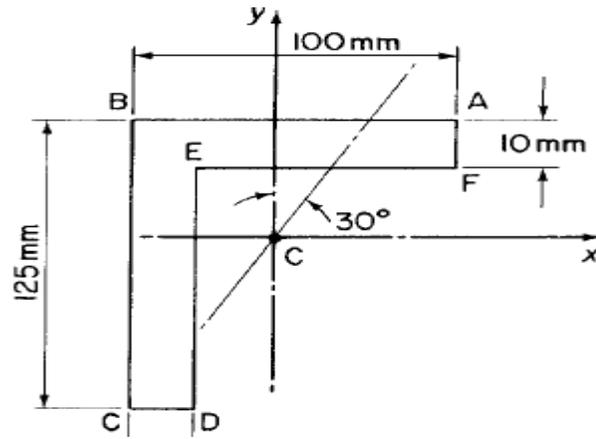


Fig 1.

12. Determine the shear flow pattern for the section shown in fig.2. The radius of left semicircle is 200 mm and that of the right semi circle is 300 mm. The section is subjected to shear load of $S_y = 10 \text{ kN}$ applied at the shear centre of the section. 16 CO2 [K4]

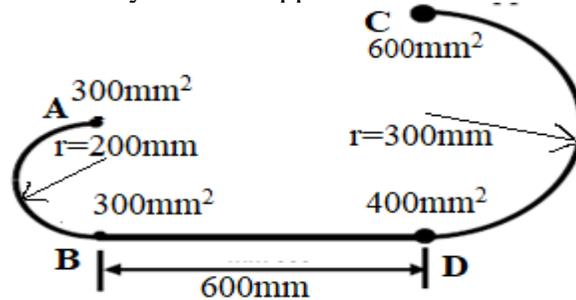


Fig 2

13. The thin-walled single cell beam shown in Fig.3 has been idealized into a combination of direct stress carrying booms and shear stress only carrying walls. If the section supports a vertical shear load of 10 kN acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section. Boom areas: $B_1 = B_8 = 200 \text{ mm}^2$, $B_2 = B_7 = 250 \text{ mm}^2$, $B_3 = B_6 = 400 \text{ mm}^2$, $B_4 = B_5 = 100 \text{ mm}^2$. 16 CO2 [K4]

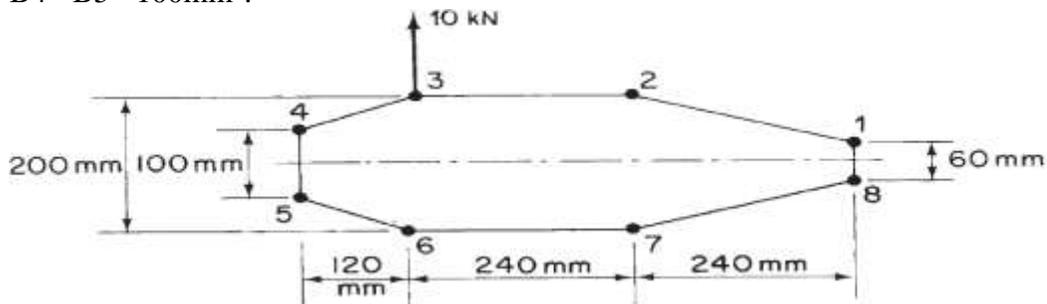


Fig 3

14. Check whether the Aluminium box beam shown in fig 4 will withstand the load without buckling. Also find the Margin of safety. Given $P_1 = P_2 = 5000 \text{ N}$; Uniform skin thickness = 1.5 mm; Area of each stringer = 2 cm^2 . Assume skin is 16 CO3 [K4]

effective in bending. For $a/b = 2$; $k_c = 5$; $k_s = 6.5$.

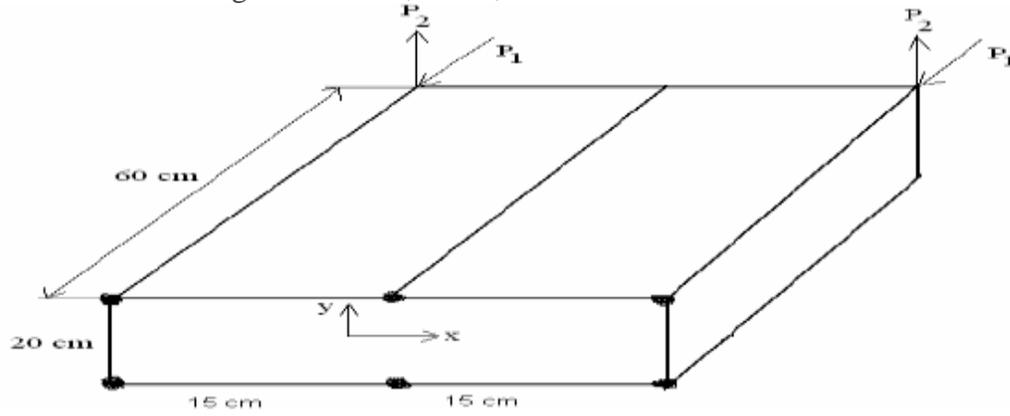


Fig 4

15. Derive the governing differential equations of the thin Plate subjected to in plane load. 16 CO3 [K₂]
16. Explain Tension field beam with a neat sketch. 16 CO4 [K₂]
