



**B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023**

(Regulation 2018)

Fifth Semester

**AERONAUTIAL 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.  
**CO5:** Determine the stress fringe value for photo-elastic materials

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

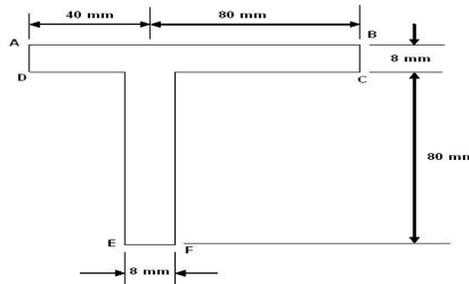
**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

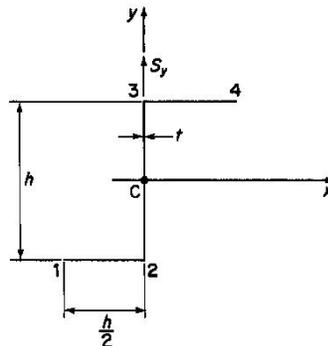
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|---|-----|-------------------|
| 1. What is principal axis for a section ?Give an expression to determine it.  | CO1 | [K <sub>1</sub> ] |
| 2. Distinguish between symmetrical and unsymmetrical bending.   | CO1 | [K <sub>2</sub> ] |
| 3. Indicate the shear center for channel section and angle section.   | CO2 | [K <sub>3</sub> ] |
| 4. Two equal area stringers are connected by a thin vertical web. The structure is subject to bending in the vertical plane. Plot the shear flow distribution when the web is effective in resisting bending. | CO2 | [K <sub>3</sub> ] |
| 5. Write the relation between torque and shear flow of the section.   | CO2 | [K <sub>1</sub> ] |
| 6. A multi-cell structure subject to pure torque is statically indeterminate. Why?  | CO2 | [K <sub>2</sub> ] |
| 7. Explain crippling stress.  | CO3 | [K <sub>2</sub> ] |
| 8. Explain effective width and give an expression to determine it.  | CO3 | [K <sub>2</sub> ] |
| 9. List out the various structural components in an aircraft wing.  | CO4 | [K <sub>2</sub> ] |
| 10. List three functions of a fuselage bulkhead.  | CO4 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

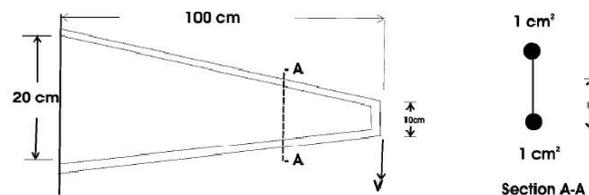
11. A beam having the cross section shown in Fig. is subjected to a bending moment of 1500 Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts. 16 CO1 [K<sub>3</sub>]



12. Estimate the shear flow distribution for the in the thin-walled section Z - section shown in Fig. Due to shear load  $S_y$  applied through the shear center of the section. 16 CO2 [K<sub>3</sub>]



13. A fuselage bulkhead of 1m diameter has 12 stringers equally placed around the section starting from top point. Each stringer area is 6.25 cm<sup>2</sup>. The bulkhead is subjected to a vertical shear load of 10 kN at the shear center. Estimate the shear flow around the bulkhead. 16 CO2 [K<sub>3</sub>]
14. Describe the various methods to determine crippling strength. 16 CO3 [K<sub>2</sub>]
15. Describe with a neat sketch the various loads that an aircraft fuselage and wing are subject to. 16 CO4 [K<sub>2</sub>]
16. The tapered beam shown in Fig. is subjected to a vertical load V. obtain the shear flow distribution at line section A-A when  $V = 10000$  N. 16 CO4 [K<sub>4</sub>]



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