

**B. TECH. (AEROSPACE ENGINEERING)
(BTAE)**

Term-End Examination

December, 2012

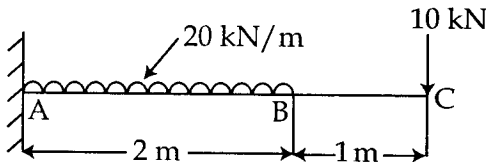
BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours

Maximum Marks : 70

Note : Answer any seven questions. Use of non-programmable scientific calculator is permitted.

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|----|-----|--|---|
| 1. | (a) | Define the term shear as it relates to an aircraft structure. | 3 |
| | (b) | What are the different types of monocoque aircraft designs ? | 4 |
| | (c) | Explain the construction of an aircraft wing. | 3 |
| 2. | (a) | Explain the Flight Envelope diagram, clearly indicating corner velocity, positive and negative load factors. | 6 |
| | (b) | Find the slope and deflection at point B for the cantilever beam as shown in Figure 1 using unit load method.
Take $EI=20000\text{kNm}^2$. | 4 |



3. (a) What are the limitations of the maximum Principal Stress theory? 3
- (b) Draw the SFD and BMD for the loaded beam as shown in figure 2. 7

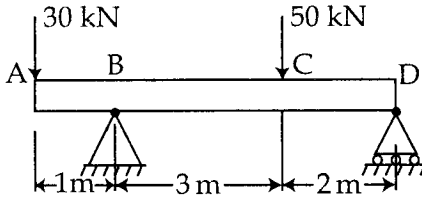


Figure 2

4. (a) What is torsional stiffness? Explain. 3
- (b) A relatively thin walled tube and a solid circular shaft have the same cross sectional area. Compare the torsional stiffness of one to the other. 7
5. (a) Define shear centre. Explain its practical significance. 4
- (b) The beam ABCD shown in Figure 3 has overhangs at each end and carries a uniform load of intensity 'q'. For what ratio 'b/L' will the bending moment at the midpoint of the beam be zero? 6

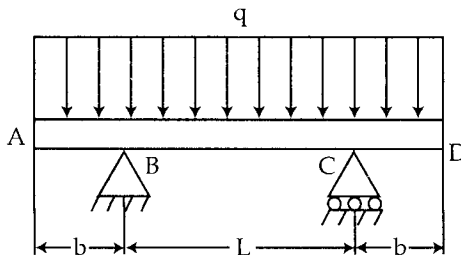


Figure 3

6. (a) The vertical shear force on a channel section is 150 kN. Find the shear flow and shear centre of the section as shown in Figure 4. Assume thickness in flange as 9.7mm and thickness of web 6.7mm. $I = 71.97 \times 10^6 \text{mm}^4$. 7

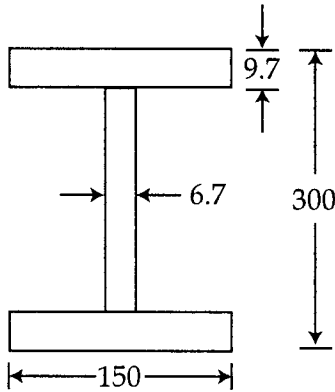


Figure 4

- (b) Differentiate between flexibility and stiffness. 3
7. (a) Explain limit load for load factor distribution. 4
- (b) How is residual stress measured using strain gauge? 6
8. (a) A hollow cylindrical steel shaft is 1.5 m long and has inner and outer diameters of 40 mm and 60 mm respectively. What torque should be applied to the end of the shaft to produce a twist of 2° ? Use the value $G = 80$ GPa for the modulus of rigidity of steel. 6

- (b) Explain how the Brittle Lacquer test is used to identify areas of concentrated stress. 4
 - 9. (a) How does a pneumatic load cell work ? 4
 - (b) Derive the equation of shearing stress in terms of torque and polar moment of inertia. 6
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