

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

Term-End Examination

00173

June, 2018

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours

Maximum Marks : 70

*Note : Answer any **seven** questions. All questions carry equal marks. Use of non-programmable calculator is permitted.*

1. Draw a typical tensile stress-strain diagram and discuss the following : 10
 - (a) Proportional Limit
 - (b) Yield Point
 - (c) Ultimate Stress
 - (d) Fracture Stress
 - (e) Elastic Limit

2. (a) What are the different types of monocoque aircraft designs ? 4
 - (b) Draw a typical V-n diagram for a jet aircraft. Explain the diagram with its salient points. 6

3. (a) What is Load Factor distribution ? Explain Limit Load. 4
- (b) What is residual stress and how is it measured using a strain gauge ? 6
4. A cantilever of length 2 metres carries a uniformly distributed load of 2500 N/m for a length of 1.25 metres from the fixed end and a point load of 1000 N at the free end. If the section is rectangular, 120 mm side and 240 mm deep, find the deflection at the free end. 10
5. (a) What do you understand by effective length of a column ? 3
- (b) A mild steel tube 4 m long, 30 mm internal diameter and 4 mm thick is used as a strut with both ends hinged. Find the collapsing load. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$. 7
6. (a) What is torsional rigidity ? 3
- (b) Find the minimum length of a high strength steel rod of 12.5 mm diameter so that one end can be twisted by 30° with respect to the other end, without exceeding a shear stress of 270 N/mm^2 . 7
- Take Modulus of Rigidity $C = 8 \times 10^4 \text{ N/mm}^2$.

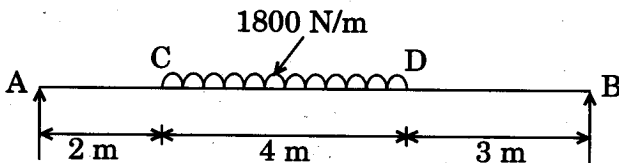
7. Explain the following airframe components/structural members : 5×2=10

- (a) Ties
- (b) Struts
- (c) Beams
- (d) Webs
- (e) Frames or rings

8. (a) A seamless pipe 800 mm diameter contains a fluid under pressure of 2 N/mm^2 . If the permissible tensile stress is 100 N/mm^2 , find the minimum thickness of the pipe. 4

(b) A cylindrical air receiver for a compressor is 2 metres in internal diameter and made of plates 12 mm thick. If the hoop stress is not to exceed 90 N/mm^2 and the axial stress is not to exceed 60 N/mm^2 , find the maximum air pressure. 6

9. A simply supported beam is carrying a uniformly distributed load on an intermediate part of the span as shown in the figure :



Draw the shear force and bending moment diagrams. 10

10. Explain the following terms :

5×2=10

- (a) Ductility
 - (b) Fatigue
 - (c) Creep
 - (d) Moment of Inertia
 - (e) Strain
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