

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

**Term-End Examination**

00164

**June, 2017**

**BAS-014 : AIRCRAFT STRUCTURES**

*Time : 3 hours*

*Maximum Marks : 70*

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

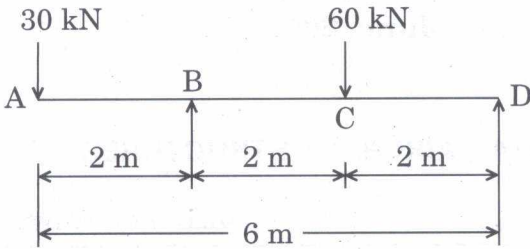
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1. (a) Explain the following terms in respect of structural limitations in airplane design : 4  
(i) Limit Load Factor  
(ii) Ultimate Load Factor
- (b) Draw a typical V-n diagram for a jet aircraft. Discuss the salient points of the diagram. 6
2. Explain the following in respect of Fuselage with the help of neat sketches : 10  
(a) Monocoque  
(b) Semi-monocoque  
(c) Truss Type

3. A 6 m long beam carries point loads as shown in the figure below. Determine the maximum deflection and state where it occurs. 10

Given :  $E = 200 \times 10^6 \text{ kN/m}^2$

$$I = 120 \times 10^{-6} \text{ m}^4$$



4. A cantilever beam of 3 m span is 15 cm wide and 25 cm deep. It carries a uniformly distributed load of 20 kN/m over its whole span and 25 kN load at its free end. Calculate the maximum slope and deflection.

Take  $E = 210 \text{ GN/mm}^2$ .

10

5. (a) A circular shaft of 50 mm diameter is required to transmit torque from one shaft to another. Find the safe torque which the shaft can transmit, if the shear stress is not to exceed 40 MPa. 5

- (b) A hollow shaft of external and internal diameters of 80 mm and 50 mm is required to transmit torque from one end to the other. What is the safe torque it can transmit, if the allowable shear stress is 45 MPa ? 5

6. Explain the following terms : 10
- (a) Elasticity
  - (b) Hooke's Law
  - (c) Slenderness Ratio
  - (d) Buckling of Column
  - (e) Triangle Law of Forces
7. (a) Explain Euler's Column Theory and state the assumptions made in the theory. 4
- (b) A steel rod, 5 m long and 40 mm diameter, is used as a column, with one end fixed and the other end free. Determine the crippling load by Euler's formula.
- Take  $E = 200 \text{ GPa}$ . 6
8. Explain the following terms : 10
- (a) Volumetric Strain
  - (b) Bulk Modulus
  - (c) Modulus of Rigidity
  - (d) Principal Stress
  - (e) Poisson's Ratio
9. A cantilever of 2 m span carries a triangular load of zero intensity at the free end and 100 kN/m at the fixed end. Determine the slope and deflection at the free end.
- Take  $I = 100 \times 10^6 \text{ mm}^4$  and  $E = 200 \text{ GPa}$ . 10

10. (a) A spherical gas vessel of 1.2 m diameter is subjected to a pressure of 1.8 MPa. Determine the stress induced in the vessel plate, if its thickness is 5 mm. 5
- (b) A spherical vessel of 2.0 m diameter is subjected to an internal pressure of 2 MPa. Find the minimum thickness of the plates required, if the maximum stress is not to exceed 100 MPa. Take efficiency of the joint as 80%. 5
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