

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

**Term-End Examination**

00133

June, 2018

**BAS-008 : STRENGTH OF MATERIALS**

*Time : 3 hours*

*Maximum Marks : 70*

---

*Note : Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume missing data suitably.*

---

1. A quadrant ring beam of radius 'r' supports a concentrated load 'P' at the free end. Calculate vertical and horizontal deflection at the free end. Also explain the concept of limit load for load factor determination. 14
  
2. (a) Define 7
  - (i) Young's modulus,
  - (ii) Shear modulus, and
  - (iii) Poisson's ratio.Write the relationship amongst them.
  
- (b) Derive an expression for elongation of a flat tapering bar subjected to an axial pull 'P'. 7

3. A metallic bar  $300 \text{ mm (x)} \times 100 \text{ mm (y)} \times 40 \text{ mm (z)}$  is subjected to a force of  $5 \text{ kN}$  (tensile),  $6 \text{ kN}$  (tensile) and  $4 \text{ kN}$  (tensile) along  $x$ ,  $y$  and  $z$  directions respectively. Determine the change in volume of the block. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and Poisson's ratio =  $0.25$ . 14

4. A mild steel rod of  $25 \text{ mm}$  diameter and  $400 \text{ mm}$  length is encased centrally inside a hollow copper tube of external diameter  $35 \text{ mm}$  and internal diameter  $30 \text{ mm}$ . The ends of the rod and tube are rigidly attached and the composite bar is subjected to an axial pull of  $40 \text{ kN}$ . Take Young's modulus of steel and copper as  $200 \text{ GN/m}^2$  and  $100 \text{ GN/m}^2$  respectively. Find the stress developed in the rod and the tube. 14

5. (a) What is meant by torsional stiffness? 4

(b) A close-coiled helical spring is to have a stiffness of  $900 \text{ N/m}$  in compression with a maximum load of  $45 \text{ N}$  and a maximum shearing stress of  $120 \text{ N/mm}^2$ . The solid length of the spring (i.e. coils touching) is  $45 \text{ mm}$ . Find

(i) the wire diameter

(ii) the mean coil radius

(iii) the number of coils.

Take modulus of rigidity of the material of the spring as  $0.4 \times 10^5 \text{ N/mm}^2$ . 3+3+4

6. (a) Derive the expression for the theory of pure torsion, with usual notations. 7
- (b) Determine the slope and deflection for a cantilever beam subjected to clockwise moment at its free end. 7
7. Write short notes on any *two* of the following : 7+7
- (a) Limitations of Euler's formula
- (b) Flexibility and Stiffness
- (c) Unsymmetrical Bending
-