B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2017

BAS-008 : STRENGTH OF MATERIALS

Time : 3 hours   *Maximum Marks : 70*

Note :   (i)   Answer *any five questions.*

(ii)   All questions carry *equal marks.*

(iii) Use of scientific calculator is permitted.

(iv) Assume missing data suitably.

1. (a) Derive an expression for maximum   7
         deflection of a cantilever beam subjected to
         uniformly distributed load.

    (b) Discuss Rankine theory and Tresca's theory   7
         of elastic failure.

2. Establish a relationship to find the shear stress   7+7
    across.
    (a) An I-section.
    (b) A circular section.
    Determine the maximum value of shear stress in
    each case.

3. At a point in a strained material, the principal   14
    streses are 100N/mm^2 (tensile), and 40 N/mm^2
    (compressive). Determine the resultant stress in
    magnitude and direction on a plane inclined at
    60° to the axis of the major principal stress. What
    is the maximum intensity of shear stress in the
    material at the point on the plane ?

4. A bolt is acted upon by an axial pull of 16 kN **14** along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to the following theories of failure :
   (a) Maximum shear stress theory
   (b) Maximum principal strain theory
   Take elastic limit of bolt to be 250 MPa, factor of safety as 2.5 and Poisson's ratio as 0.3.

5. (a) Draw a stress-strain diagram for mild steel **4** indicating the important points.
   (b) A tapering rounding bar, whose diameter **10** is varying from d_1 to d_2, is subjected to an axial load of P. If the length of the bar is L and Young's modulus of elasticity of the bar material is E, then prove that the total elongation of the bar is given by $\dfrac{4\,PL}{\pi E d_1 d_2}$.

6. (a) Explain strain energy, resilience and proof **6** resilience.
   (b) A mild steel bar of diameter 30 mm and **8** length 2.4m is subjected to a tensile load of 90 kN. Find the strain energy stored in the bar, if the load is applied gradually. Also determine the modulus of resilience if proportional limit is 220 MPa. Take $E = 200 \text{ GN/m}^2$

7. Write short notes on following : $4 \times 3\frac{1}{2} = 14$
   (a) Flitched beams
   (b) Castigliano's first theorem
   (c) Factor of safety
   (d) Section modulus