

**B.TECH. (AEROSPACE ENGINEERING)
(BTAE)****Term-End Examination****June, 2014****BAS-008 : STRENGTH OF MATERIALS***Time : 3 Hours**Maximum Marks : 70*

- Note :** (i) *Answer any five questions.* (TM)
(ii) *All questions carry equal marks.*
(iii) *Use of (Non - Programmable, scientific calculator) calculator is permitted. Assume any missing data if required.*

1. Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and length 1.5 m, if the longitudinal strain in bar during a tensile stress is four times the lateral strain. Find change in volume, when bar is subjected to a hydrostatic pressure of 100 N/mm^2 . Take $E = 1 \times 10^5 \text{ N/mm}^2$. 14
2. At a point in a strained material, the principle stresses are 100 N/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 principle stress. What is the maximum intensity of shear stress in the material at the point on the plane ? 14

3. A bolt is acted upon by an axial pull of 16 kN along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to following theories of failure : 14
- Maximum shear stress theory
 - Maximum principle strain theory
 - Maximum strain energy theory
 - Maximum shear strain energy theory
 - Maximum principle stress theory
- Take Elastic limit of bolt to be 250 MPa, Factor of safety as 2.5 and poisson's ratio is 0.3.

4. A beam 10 m long and simply supported at each end, has a uniformly distributed load of 1000 N/m, extending from left end upto the centre of beam. There is also an anticlockwise couple of 15 kNm at a distance of 2.5 m from the right end (as shown in fig 1) Draw S.F(shear force) and Bending moment diagrams. 14

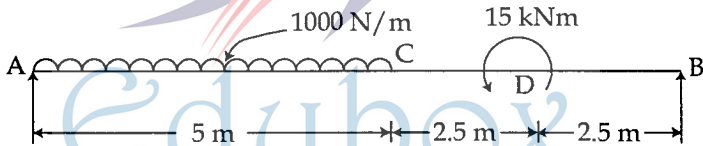


Fig. 1

5. (a) A timber beam of rectangular section is to support a load of 20 kN/m uniformly distributed over a span of 3.6 m when beam is simply supported. If depth of section is to be twice the breadth, and the stress in timber is not to exceed 7 N/mm², find dimension of the cross section for the beam. 7
- (b) How would you modify the cross section of beam in 5(a), if it carries a concentrated load of 20 kN placed at centre with the same ratio of breadth to depth ? 7

6. Using the castigliano's theorem, determine deflection and the slope at the free end of a cantilever with uniformly distributed load on the whole span. 14
7. Establish relationship to find the shear stress across
- (a) An I - Section 7
- (b) A circular Section 7
- What is the maximum value in each case ?
8. (a) Deduce the relation for stress in case of shock load. 4
- (b) A 1 meter long bar of rectangular cross - section 50 mm x 80 mm is subjected to an axial load of 1.2 kN. Determine the maximum stress and strain energy developed in bar if the load is applied : 10
- (i) Gradually
- (ii) Suddenly
- (iii) Falls through a height of 25 mm.
- (E = 205 Gpa)

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