| BAS-008 |

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00314

June, 2017

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 fixed beam is subjected to a point load at its mid-span. Derive the equation for determining :

    (a) Shear force

    (b) Bending moment

    (c) Slope

    (d) Deflection

    Also draw the corresponding diagram.   *14*

2. (a) What do you understand by 'simple bending' or 'pure bending' ? Discuss the assumptions made in the theory of simple bending.   *7*

    (b) Explain 'Section Modulus'. Derive an expression for determining the section modulus for a circular section.   *7*

3. 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 a bar during tensile loading is four times the lateral strain. Also find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2. Take E = 1 × 10^5 N/mm^2. *14*

4. Show that the strain energy U due to bending of a beam of rectangular section, simply supported at ends with a concentrated load P at the centre can be expressed as

$$U = \frac{\sigma^2}{18\,E} \times (\text{Volume of beam})$$

where σ is the maximum bending stress in the beam, and E is the Young's modulus. Compare the strain energy when the beam is loaded axially by the same load P. The ratio of length of the beam to depth is 6. *14*

5. (a) Explain with reasons which theory of failure is best suited for ductile materials. *4*

(b) A closely coiled helical spring of round steel wire 10 mm in diameter having 10 complete turns with a mean diameter of 12 cm is subjected to an axial load of 200 N.

Determine

(i) the deflection of the spring,

(ii) the maximum shear stress in the wire, and

(iii) the stiffness of the spring.

<div align="center">(Take $C = 8 \times 10^4$ N/mm^2)</div> <div align="right">*3+3+4*</div>

6. Derive an expression for strain energy stored in a body,

    (a)   when the load is applied with impact

    (b)   when the load is applied gradually.   *7+7*

7. Write short notes on any ***two*** of the following :   *7+7*

    (a)   Mohr's Stress Circle

    (b)   Euler's Theory for Column

    (c)   Moment of Resistance

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