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BAS-008

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

December, 2018

00353

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 rolled steel joist of I section used as a simply supported beam has the following dimensions :

Flange	:	(250×25) mm
Web	:	15 mm thick
Overall depth	:	(50) mm

If this beam carries a UDL of 50 kN/m on a span of 4 m, calculate maximum stress produced due to bending. *14*

2. (a) Define Principal stresses and Principal planes. Show that principal planes and maximum shearing planes are inclined at 45° with each other. *7*

(b) Derive the relationship between BM, SF and intensity of UDL. *7*

3. A thin cylindrical shell 2·5 m long has 700 mm internal diameter and 8 mm thickness. If the shell is subjected to an internal pressure of 1 MPa, find the hoop and longitudinal stresses developed along with the maximum shear stress induced. Also find the changes in diameter, length and volume. Take modulus of elasticity of the wall material as 200 GPa and Poisson's ratio as 0·3. *14*

4. Prove that the ratio of depth to width of the strongest beam that can be cut from a circular log of diameter d is 1·414. Hence calculate the depth and width of the strongest beam that can be cut out of a cylindrical log of wood whose diameter is 300 mm. *14*

5. (a) What is meant by circumferential stress ? *4*

   (b) The stiffness of a close-coiled helical spring is 1·5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire is 125 N/mm^2. The solid length of the spring (when the coils are touching) is 50 mm. Find

   (i) the diameter of the wire,

   (ii) the mean diameter of the coils, and

   (iii) number of coils required. *3+3+4*

   Take $C = 4·5 \times 10^4$ N/mm^2.

6. (a) Derive the expression for Euler's buckling load for a column with both ends fixed. 7

(b) Prove the torsional formula

$$\frac{T}{J} = \frac{G\theta}{L} = \frac{\tau}{R},$$

where symbols carry usual meaning. 7

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

(a) Young's Modulus and Bulk Modulus

(b) Mohr's Stress Circle

(c) Torsional Rigidity