No. of Printed Pages : 3 **BAS-008**

00105

B.TECH. (AEROSPACE ENGINEERING) PROGRAMME (BTAE)

Term-End Examination

June 2012

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 (Non-Programmable, Scientific calculator) calculator is permitted. Assume any missing data if required.

1. Derive the equation for normal stress σ_n and shear stress. T_s when an elemental body is subjected to two mutually perpendicular stresses σ_x and σ_y shown below on an inclined plane at θ along with τ_{xy}. **14**

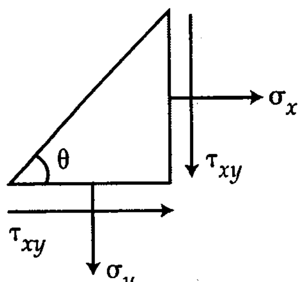

Figure - 1

2. Three tubes A, B, and C are fitting loosely one over the other. Tube A is inside and tube C is outside. Each tube has a thickness of 10 mm and length of 300 mm. Inner tube A has an internal diameter of 100 mm. If an axial thrust of 150 kN is applied, find for each tube (a) load carried. (b) stress developed and (c) shortening due to load. **14**

Take $E_A = 200GPa$, $E_B = 100GPa$ and $E_C = 50GPa$.

3. (a) Derive the equation for shearing stress on principal plane. **7**

   (b) Derive expression for Euler's theory for column with one end fixed and the other end free. **7**

4. The principal strains at a point in a material are in the ratio of 4 : 3 : 2. Find the ratio of principal stresses at that point. Take $\mu = 0.3$. **14**

5. For a simply supported beam with loads as shown in figure 2, draw SF and BM diagrams indicating max. BM and max. SF. **14**

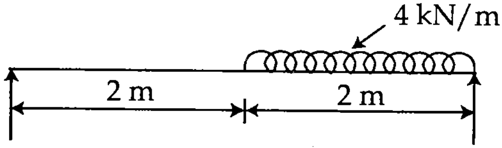

Fig. 2

6. Find the shear stress produced in torsion (or pure shear) at the point of failure in terms of the failure stress σ in simple tension according to each of the following theories of elastic failure. **14**

(a) Maximum principal stress theory.

(b) Maximum principal strain theory

(c) Maximum shear stress theory

(d) Strain energy theory

(e) Distortion energy theory (Octahedral shearing stress theory), and

(f) Internal friction theory.

Take failure stress in tension to be equal to the failure stress in compression (i.e. the material under consideration is ductile) and $\mu = 0.25$.

7. Using the Castigliano's theorem, obtain the expression for deflection at the centre of a simply supported beam carrying a uniformly distributed load. **14**

8. Find the fixing moments and reactions for a fixed beam of length $L = (a + b)$ carrying a concentrated load at a distance 'a' from one end. Take EI to be constant. **14**