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BAS-008

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00343

December, 2016

BAS-008 : STRENGTH OF MATERIALS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

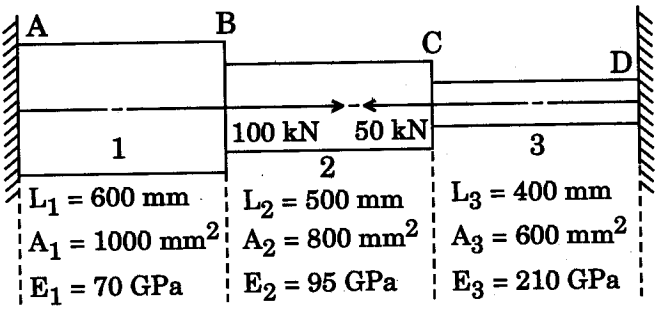
1. (a) Define (i) Young's modulus, (ii) Shear modulus, and (iii) Poisson's ratio. Write the relationship between them. *4*

(b) Derive an expression for elongation of a flat tapering bar subjected to an axial pull. *6*

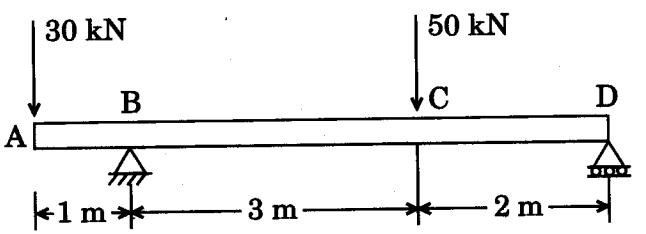
2. A steel rod is 18 m long at a temperature of 25°C. Find the free expansion when the temperature is raised to 85°C. Also find the temperature stress produced when (i) the expansion is fully prevented, and (ii) the rod is allowed to expand by 4·5 m.

Take E = 200 kN/mm^2 and $\alpha = 12 \times 10^{-6}$/°C. *10*

3. Two forces of 50 kN and 100 kN are applied to a bar fixed between two unyielding supports. Compute the stresses induced in different materials. The material properties and that of the bar are as shown in figure. *10*



4. Draw the SFD and BMD for the loaded beam as shown in the figure below : *10*



5. (a) What is torsional stiffness ? Explain its significance. *4*

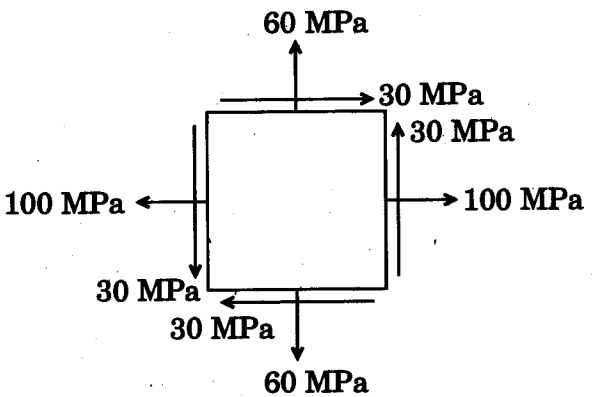
(b) A relatively thin walled tube and a solid circular shaft have the same cross-sectional area. Compare their torsional stiffness . *6*

6. At a point in a strained material, the state of stress is as shown in the figure below. Compute the following :

   (a) Principal stresses and Principal planes

   (b) Maximum shearing stress and Maximum shearing planes

   Sketch these planes. *10*



7. A simply supported beam AB has a span of 5 m and carries a point load of 60 kN at a distance of 3 m from its left end A. Find the ratio of maximum deflection to the deflection under point load. *10*

8. (a) List the assumptions made in Euler's theory of long columns. *5*

   (b) Derive the expression for Euler's buckling load for a column with both ends fixed. *5*

9. (a) Define any ***two*** of the following : *2×3=6*

(i) Principal plane and Principal stress

(ii) Euler's load and Rankine's load

(iii) Shearing stress and Flexural strength

(b) Find the expressions for maximum slope and maximum deflection for a cantilever beam subjected to a point load at the free end. *4*

10. (a) Derive the relationship between BM, SF and intensity of UDL. *5*

(b) Show that the principal planes and maximum shearing planes are inclined at 45° with each other. *5*