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BAS-008

B.Tech. (AEROSPACE ENGINEERING) (BTAE)

00158

Term-End Examination

June, 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) Draw a neat sketch of Stress – Strain curve for a mild steel specimen in tension. Mark the salient points on it. *5*

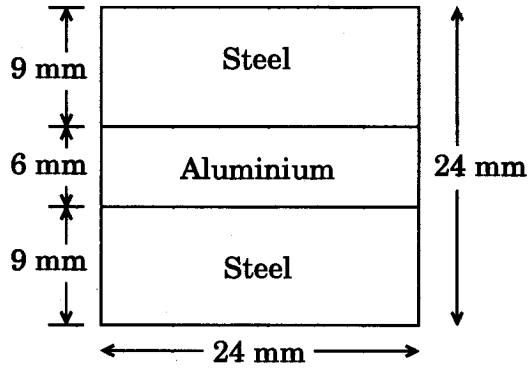
(b) Derive the relationship between Young's modulus and Bulk modulus of a material. *5*

2. A 1·5 m long steel bar has a uniform diameter of 40 mm for a length of 1 m and in the next 0·5 m, its diameter gradually reduces to 20 mm. Determine the elongation of the bar when subjected to an axial tensile load of 160 kN. Take E = 200 GPa. *10*

3. A flat bar of aluminium alloy, 24 mm wide and 6 mm thick, is placed between steel bars each 24 mm wide and 9 mm thick to form a composite bar (24 × 24 mm) as shown in the figure below. The three bars are fastened together at the ends when the temperature is 10°C. Find the stresses in each of the materials, when the temperature of the whole assembly is raised to 50°C. If at the new temperature, a compressive load of 20 kN is applied to the composite bar, what are the final stresses in steel and aluminium ?

$E_s = 2 \times 10^5$ N/mm^2, $E_a = \frac{2}{3} \times 10^5$ N/mm^2,

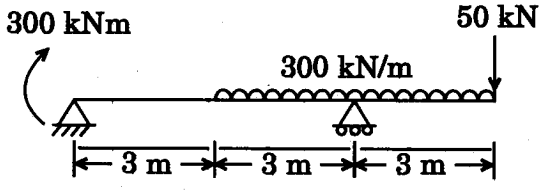
$\alpha_s = 1{\cdot}2 \times 10^{-5}$/°C, $\alpha_a = 2{\cdot}3 \times 10^{-5}$/°C *10*



4. (a) Derive the relationship between intensity of load, shear force and bending moment. *5*

(b) Show that the maximum bending moment in a beam subjected to UDL throughout is $wl^2/8$ with usual notations. *5*

5. Draw the SFD and BMD for the beam shown in the figure below : *10*

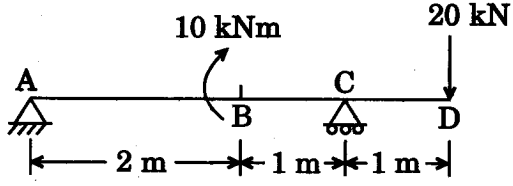


6. (a) Explain the term 'beam of uniform strength' with the help of neat sketches. *4*

(b) Determine the slope and deflection of a cantilever beam subjected to clockwise moment at its free end. *6*

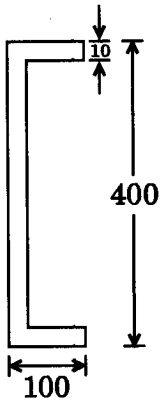
7. Determine the deflection at B and D for the beam shown in the figure below.

Assume E = 210 GPa and I = $1{\cdot}6 \times 10^7$ mm^4. *10*



8. (a) Write Euler's formula for maximum stress for an initially bent column. What are the factors on which deflection of a spring beam depend ? *5*

(b) The vertical shear action on a channel section is 3 kN. Find the shear centre of the section as shown in the figure below. Assume constant thickness of 10 mm throughout the section and $I = 1{\cdot}21 \times 10^8$ mm^4. *5*



All dimensions are in mm.

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

(i) Buckling load and Slenderness ratio

(ii) Neutral axis and Section modulus

(iii) Flexural rigidity and Modulus of rupture

(b) What are the limitations of Euler's formula ? *4*

10. Derive the expression for the theory of pure torsion, with usual notations. *10*