Code: 9A01302 **R09**

B.Tech II Year I Semester (R09) Supplementary Examinations December 2015

STRENGTH OF MATERIALS - I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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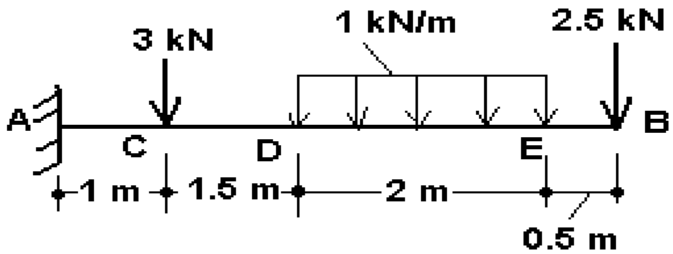
1 Rails of 15 m length were laid on the track when the temperature was 20^0C. A gap of 1.8 mm was kept between two consecutive rails. At what maximum temperature the rails will remain stress free ? If the temperature is raised further by 15^0C, what will be the magnitude and nature of stresses induced in the rails? Take $\alpha_s = 12 \times 10^{-6}$ /^{o}C.

2 Draw SFD & BMD for the beam shown in below figure.

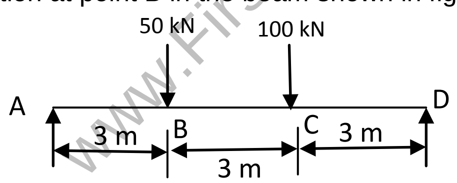


3 (a) A circular bar is to be used as a beam subjected to a bending moment of 145 N-m. Compute the required dimensions of the bar to limit the stress to 55 MPa.

(b) A square bar 30 mm side is used as a simply supported beam subjected to a bending moment of 425 N-m. Compute the maximum stress due to bending in the bar.

4 A beam of square section is used as a beam with one diagonal horizontal. Find the magnitude and location of maximum shear stress in the beam. Also sketch the shear stress distribution across the section.

5 Determine the deflection at point B in the beam shown in fig. Take E = 200 kN/mm^2 and I = 200 x 10^6 mm^4.



6 A cantilever AB built in at A and free at B is of length L. The second moment of area of its cross-section is I for a length of L/3 from B, 2I for the next length L/3 and 3I for the last length L/3 ending at A .There is a concentrated load W at the free end .Derive in terms of W, L, I and E an experience for the slope at the free end of the cantilever, where E is the modulus of elasticity of the material.

7 A mild steel bar is of square section. E for the material is 210 GPa .Poisson's ration v = 0.25.The bar I subjected to an axial compression of 60 MPa and two lateral stresses mutually at right angles and acting on the faces and of such magnitude as to prevent all strain in direction other than axial .Show that under these conditions the axial stress and in the bar give a modified elasticity modulus of 252 GPa.

8 Determine the diameter of a blot which is subjected to an axial pull of 9 kN together with a transverse shear force of 4.5 kN using (i) Maximum principal stress theory. (ii) Maximum distortion theory. Given the elastic limit in tension = 225 N/mm^2, factor of safety = 3 and Poisson's ratio = 0.3.

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