Find the elongation of the tapering bar if $E_s = 2\times10^5$ N/mm^2. 5

(*c*) A rod of diameter 40 mm and length 6 m has an allowable tensile stress of 120 N/mm^2. If the Young's modulous of the rod material is 2.1×10^5 N/mm^2.
Determine the (*i*) maximum tensile load, that can be suddenly applied to the rod (*ii*) strain energy stored in the rod. 7

6. (*a*) Define ductility and mallebility of a material. 2

(*b*) Write down the assumptions of simple bending. 5

(*c*) A cast iron hollow column of external diameter 10 cm and internal dia 8 cm and length 2.2 mt. Using Rankine's formula determine the crippling load when both ends are fixed. Take F_c = 6000 kg/cm^2 and Rankine's constant 1/1600. 7

7. (*a*) Define torsional rigidity. 2

(*b*) A circular beam 200 mm diameter is subjected to a shear force of 10 kN. Calculate the value of maximum shear stress and sketch variation of shear stress along the depth of beam. 5

(*c*) A cast iron water main 10 m long of 400 mm external diameter and 20 mm wall thickness runs full of water and is supported at its ends. Calculate the maximum stress in the metal if the density of cast iron is 7200 kg/m^3 and that of water is 1000 kg/m^3. 7