CIV100 – MECHANICS – SECTION 5

<u>Assignment No. 9</u> – Thursday, November 21, 2013

Due: 11:10 a.m., Tuesday, November 26, 2013, stapled and on correct "engineering paper".

<u>Topics</u>: Bending stresses and design of beams; Fluid statics

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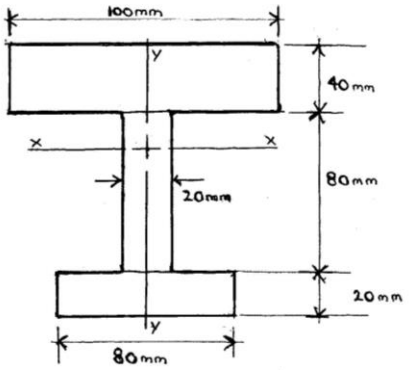
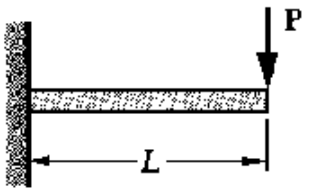
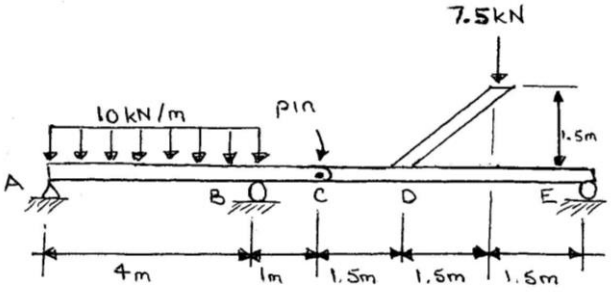
1. A cantilever beam is 1.6 m long and subjected to a point load (P) as shown. If the material has a maximum allowable bending stress of 40 MPa in compression and 60 MPa in tension, determine the value of P (P_{max}) that will cause it to fail. An enlarged cross section is provided.

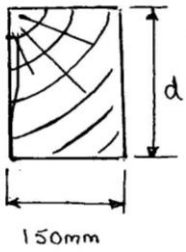




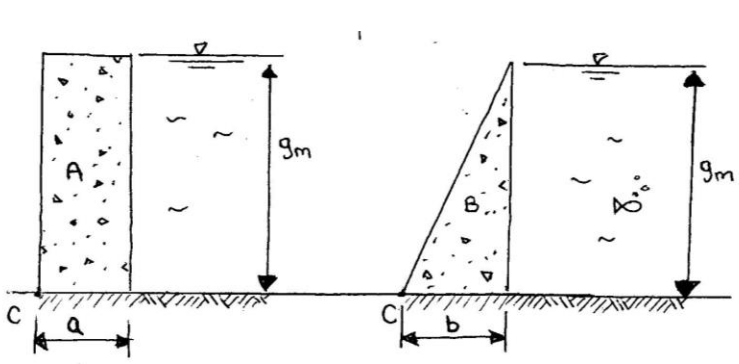
2. If the beam is rotated 90°, such that bending occurs about the orthogonal (y-y) axis, determine the new value of P_{max} that will cause failure.

3. Beam ABCDE is made of wood and has a failure stress of 8 MPa in both tension and compression. If a load (safety) factor of 1.9 is required, determine the minimum depth, d, of the cross section. Depths are only available in 25 mm increments. Neglect the weight of the beam.





4. The two cross sections shown below are being considered for a small dam in a fresh water river. Determine, for both cases, the weight of concrete required **per meter length** of dam to prevent overturning about point C. Assume that $\rho_{concrete} = 2400\ kg/m^3$.



5. The cross section of a 5 m long dam for a fresh water lake is shown. Over time a layer of silt has settled on the bottom of the lake to a depth of 2 m. Assuming that the silt is equivalent to a liquid which has a density of 1760 kg/m^3, determine the factor of safety against overturning about point A. Assume that $\rho_{concrete}$ = 2400 kg/m^3.