

**CVG2140 – Assignment No. 5 (Flexural Stresses)**

**(Due Date: Friday, March 13<sup>th</sup>, 2015)**

**Problem 1.** A simply supported wood beam  $AB$  with span length  $L = 3.5$  m carries a uniform load of intensity  $q = 6.4$  kN/m (see Fig. 1). Calculate the maximum bending stress  $\sigma_{\max}$  due to the load  $q$  if the beam has a rectangular cross section with width  $b = 150$  mm and height  $h = 280$  mm.

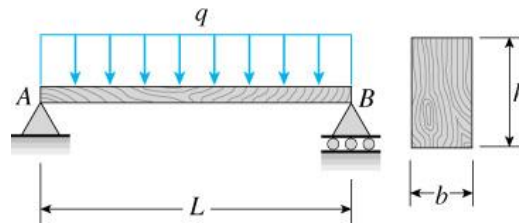


Fig. 1

**Problem 2.** A seesaw weighing 5 kg/m of length is occupied by two children, each weighing 40 kg (see Fig. 2). The centre of gravity of each child is 2.5 m from the fulcrum. The board is 5.8-m long, 20-cm wide and 4-cm thick. What is the maximum bending stress in the board?

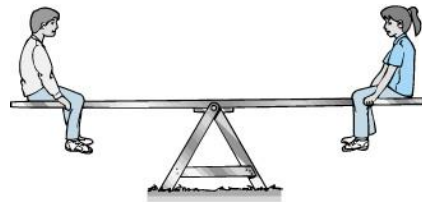


Fig. 2

**Problem 3.** A small dam of height  $h = 2.4$  m is constructed of vertical wood beams  $AB$  of thickness  $t = 160$  mm, as shown in Fig. 3. Consider the beams to be simply supported at the top and bottom. Determine the maximum bending stress  $\sigma_{\max}$  in the beams, assuming that the weight density of water is  $\gamma = 9.81$  kN/m<sup>3</sup>. Hint: the hydrostatic pressure  $p$  in still water is  $p = \gamma d$  (Pa), where  $\gamma$  is the weight density of water (N/m<sup>3</sup>) and  $d$  is the depth from the free surface (m). Do the problem for 1 m of the dam width.

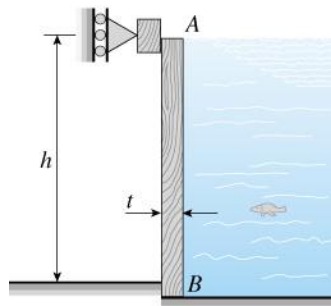


Fig. 3

**Problem 4.** The beam shown in Fig. 4 has a T cross section with moments of inertia with respect to  $y$  and  $z$  equal to  $I_y = 15.63 \times 10^6 \text{ mm}^4$  and  $I_z = 53.13 \times 10^6 \text{ mm}^4$ , respectively. For the beam section where the absolute value of the internal bending moment is maximum,  $M = |M_{\max}|$ , find the maximum bending stress  $|\sigma_{\max}|$  and the bending stress @ H  $\sigma_H$  (is  $\sigma_H$  compressive or tensile?). Considering the entire beam, find the maximum tensile bending stress  $\sigma_{\max, \text{Tensile}}$ .

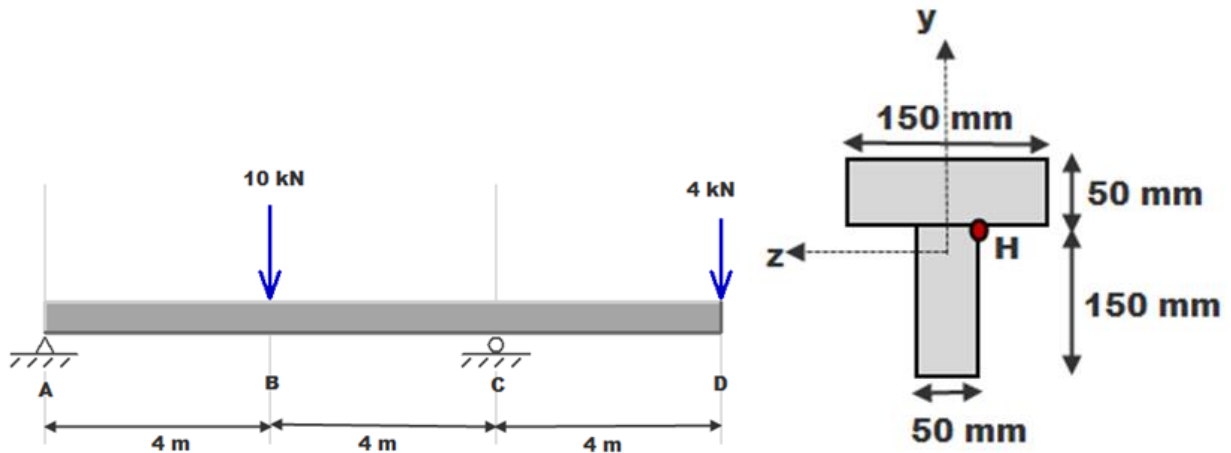


Fig. 4