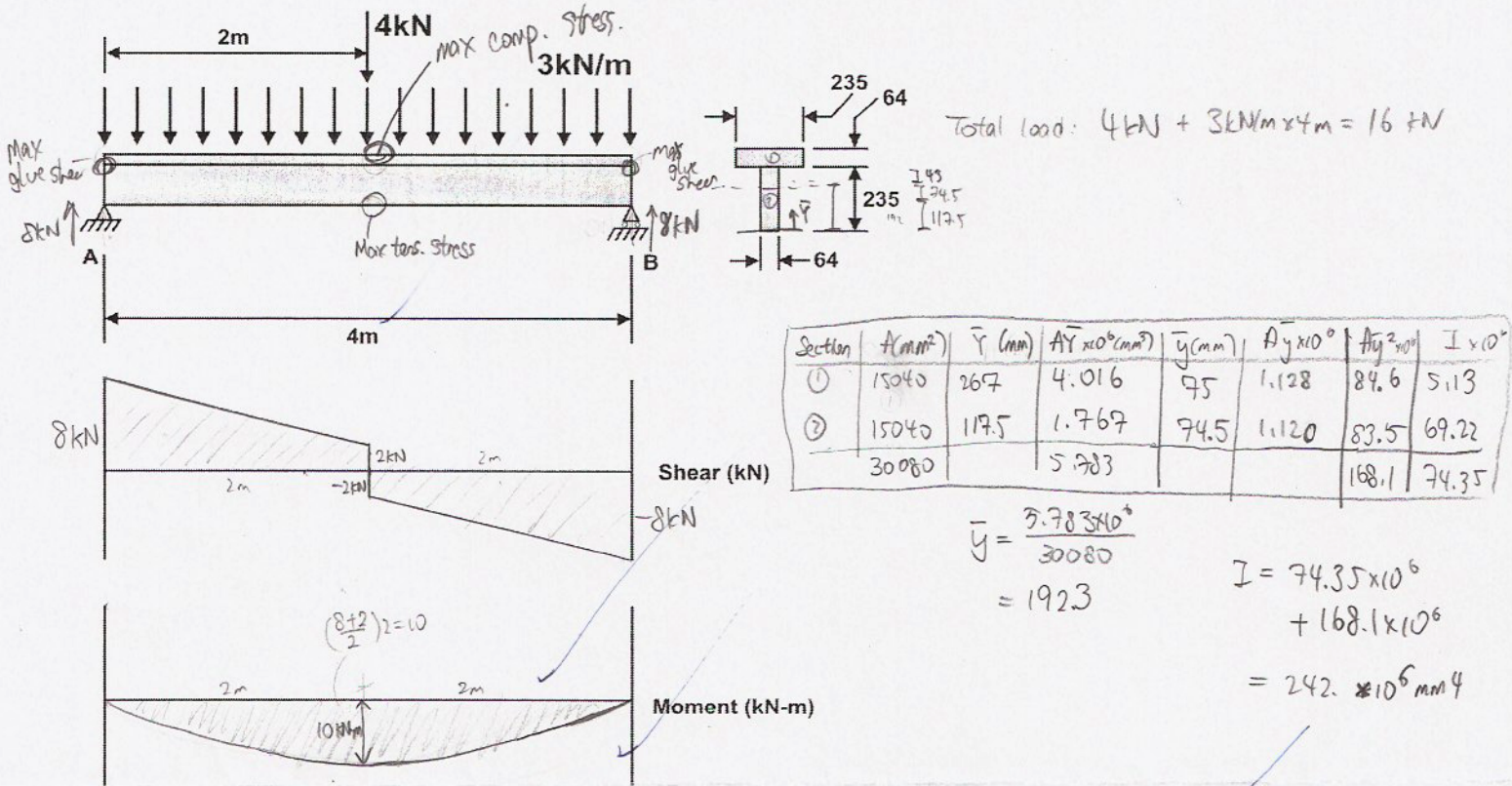


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**CIV102F Quiz # 11: Thursday November 23, 2006**

The timber T-beam shown below has been made by gluing together two 64x235 sawn timber sections. It is subjected to a uniformly distributed load of 3kN/m over its entire span, and a point load of 4kN at midspan.

- Calculate and draw the shear force and bending moment diagrams in the space provided.
- Calculate the maximum compressive stress in the beam and show on the drawing where it occurs.
- Calculate the maximum tensile stress in the beam and indicate on the drawing where it occurs.
- Calculate the maximum shear stress which the glue must resist and indicate on the drawing where it occurs.



b)  $\sigma = \frac{My}{I}$

$\sigma_c = \frac{(10 \times 10^6 \text{ N}\cdot\text{mm})(106.7 \text{ mm})}{242 \times 10^6 \text{ mm}^4}$

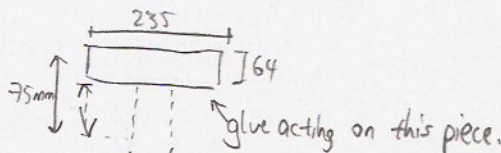
$\sigma_c = 4.41 \text{ MPa}$

c)  $\sigma = \frac{My}{I}$

$\sigma_t = \frac{(10 \times 10^6 \text{ N}\cdot\text{mm})(192.3)}{242 \times 10^6 \text{ mm}^4}$

$\sigma_t = 7.95 \text{ MPa}$

d)  $\tau_{\text{glue}} = \frac{VQ}{Ib}$



$Q_{\text{glue}} = 235 \times 64 \times 75$   
 $= 1.128 \times 10^6 \text{ mm}^3$

$b_{\text{glue}} = 64 \text{ mm}$  (contact surface)

$\tau_{\text{glue}} = \frac{8 \times 10^3 \text{ N} \times 1.128 \times 10^6 \text{ mm}^3}{242 \times 10^6 \text{ mm}^4 \times 64 \text{ mm}}$

$= 0.583 \text{ MPa}$