



QUIZ 5

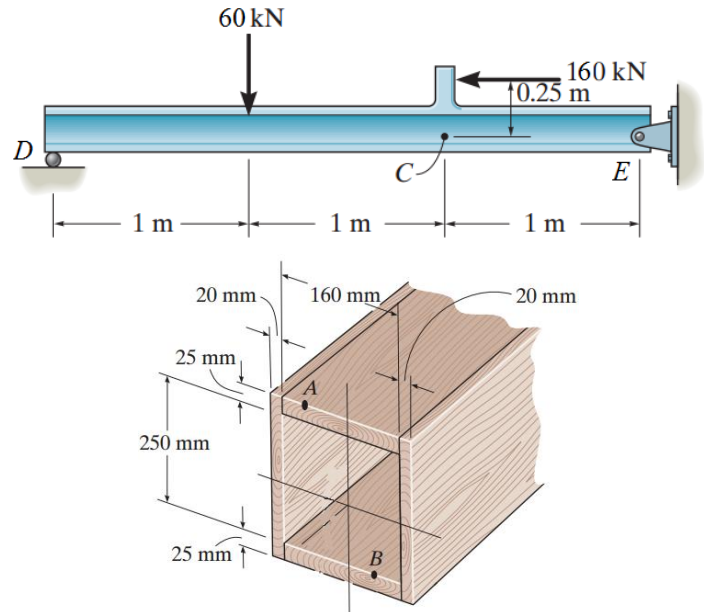
20 February 2015
Doç. Dr. M. Ali Güler

Ad, Soyad: **SOLUTION**
No: _____

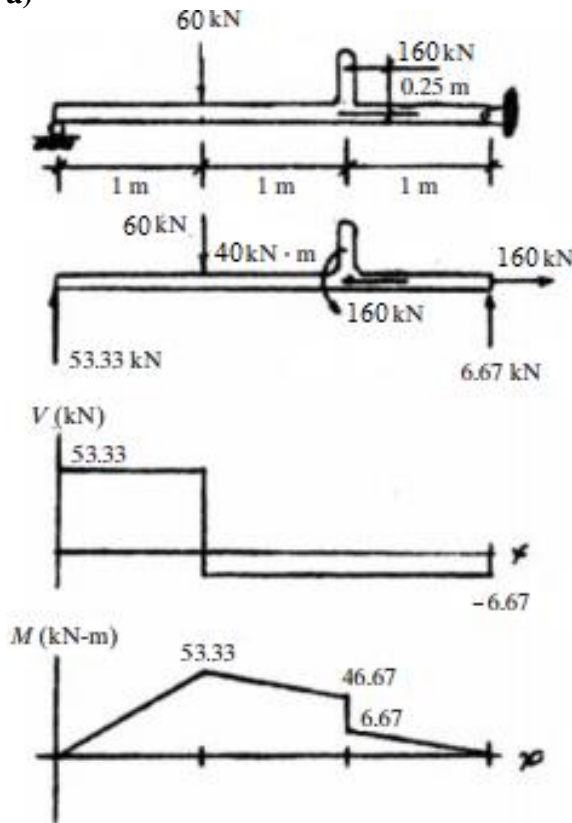
Problem: Beam DCE has a box cross section. The dimensions are shown.

- Draw the shear and moment diagrams for the beam. (Hint: The 160 kN load must be replaced by equivalent loadings at point C on the axis of the beam.)
- Determine the absolute maximum bending stress in the beam and factor of safety.
- For the critical point of the beam, determine the stress at points A and B.

Given: $\sigma_{all} = 110 \text{ MPa}$



a)



b) $M_{max} = 53.33 \text{ kN.m}$

The moment of inertia of the cross-section about the neutral axis is

$$I = \frac{1}{12} (0.2)(0.3^3) - \frac{1}{12} (0.16)(0.25^3) = 0.2417(10^{-3}) \text{ m}^4.$$

$$\sigma_{max} = \frac{Mc}{I} = \frac{53.33(10^6)(150)}{2417(10^5)} = 33.09 \text{ MPa}$$

$$F.S. = \frac{\sigma_{all}}{\sigma_{max}} = \frac{110}{33.09} = 3.32$$

c)

$$\sigma_A = \frac{My_A}{I} = \frac{53.33(10^6)(150)}{2417(10^5)} = 33.09 \text{ MPa}$$

$$\sigma_B = \frac{My_B}{I} = \frac{53.33(10^6)(125)}{2417(10^5)} = 27.57 \text{ MPa}$$