ARCH 614: Practice Quiz 2

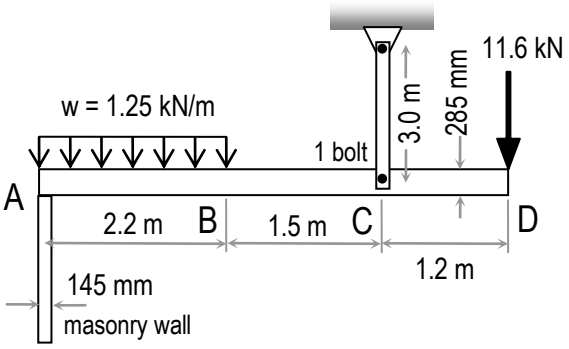
Note: No aids are allowed for part 1. One side of a letter sized paper with notes is allowed during part 2, along with a silent, ***non-programmable*** *calculator. There are no reference charts for part 2.*

Clearly show your work and answer.

Part 1) Worth 5 points
(conceptual questions)

Part 2) Worth 45 points

(NOTE: The units, dimensions, loading, location for the two supports for the beam, and the materials used can and will be changed for the quiz! The loading types on the beam will not.)



A 285 mm deep, 40 mm wide timber beam is supported on a 145 mm wide masonry wall at end A (considered a roller support) and with a metal strap and bolt at point C (considered a pin). The beam is loaded as shown.

Find:

a) The support reaction forces and directions at A and C.

b) The length change of the steel strap if it is 3.0 m long and has a cross section area of 160 mm^2 when $E = 200 \times 10^6$ kPa.

c) The temperature change (and direction) required so that the metal strap is only 0.85 mm longer than the original length (before loading) if $\alpha_{metal} = 11.7 \times 10^{-6}$ /°C.

d) The minimum bolt diameter required for the one at C if the allowable shear stress is 95 MPa.

Answers – Not provided on actual quiz!

a) RA = -1.83 kN (down), RC = 16.18 kN (up)
b) $\delta = 1.5$ mm
c) $\Delta T = -18.5$ °C (colder)
d) $D \geq 14.7$ mm