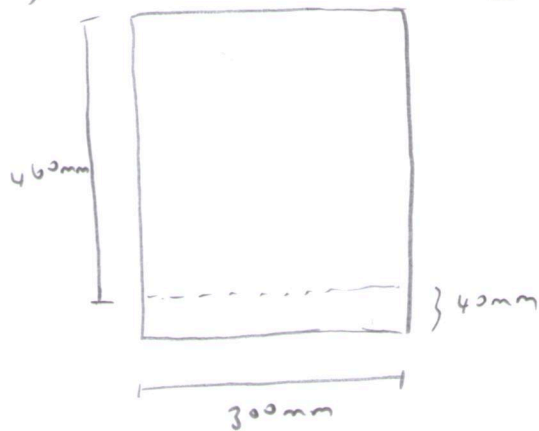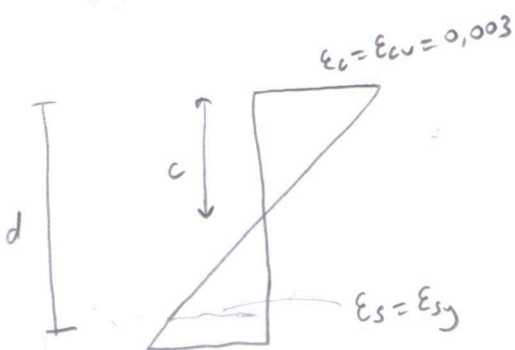Materials C20
S 420

material factors

$$\gamma_{ms} = 1,15$$

$$\gamma_{mc} = 1,5$$

460mm

340mm

300mm

a) Find the reinforcement area to satisfy the balanced lines.

In the balanced failure situation, we should assume that
steel reinforce has just yielded, i.e $\varepsilon_{sy} = \dfrac{420/1,15}{200000} = 0,0018$

$\varepsilon_c = \varepsilon_{cu} = 0,003$

c

d

$\varepsilon_s = \varepsilon_{sy}$

$$\frac{0,003}{c} = \frac{0,0018}{460 - c}$$ (similarity of triangles)

$$-0,003 \, c = 0,0018 \, c$$

$$1,38 = 0,0048 \, c$$ (from γ_m part)

$$c = 287,5 \, mm$$

Force equilibrium ---

$$F_c + F_T = 0$$

$$300 \times 0,85 \times \frac{f_{ck}}{1,5} \times k \times c_1 - \frac{f_{sy}}{1,15} \ast As_{teel} = 0$$

$$300 \times 0,85 \times \frac{20}{1,5} \times 0,85 \times 287,5 = \frac{420}{1,15} \ast As_{teel}$$

$$\Rightarrow As_{teel} = 2275,06 \, cm^2$$

①