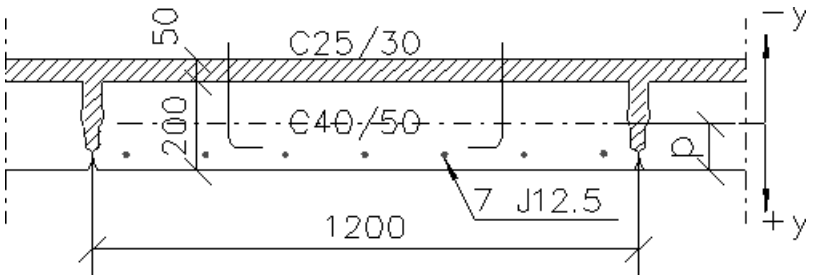
Rak 43-3111

Exercise 5 Composite structure

Precast plank b*h=1200*200 mm + topping b*h=1200*50 mm



Strands in the precast plank: 7 d 12,5 mm prestress after losses $\sigma_{p\infty}$ = 1000 MPa,
elastic modulus E_p=195000 MPa

Concrete: precast plank C40/50, elastic modulus Ec1=35200 MPa f_{ctm} = 2.46 MPa
topping C25/30, elastic modulus Ec2=31500 MPa

Shrinkage: precast plank before casting of the topping ε_{cs1} = -0.133 ‰
after casting of the topping ε_{cs2} = -0.417 ‰
topping (final value) ε_{cs3} = -0.6 ‰

Creep factor ϕ=1,73 for stresses due to diffrential shrinkage; ageing coefficient χ=0,8

Section stiffness values for the composite cross-section (effect of creep is included the values):
Axial stiffness EA=4164 MN
Flexural stiffness EI=19.584 MNm^2
centroid from the bottom fibre p=112.9 mm

Calculate stresses due to shrinkage strain difference between the precast plank and the topping
Calculate the cracking moment if the stress at the bottom fibre of the precast plank due to shelf-weight of the precast pank and the topping and prestrerssing just before composite action σ_{c1} =-2,93 MPa.
For prestress losses after comoste action the stress due to differential shrinkage is taken into account.