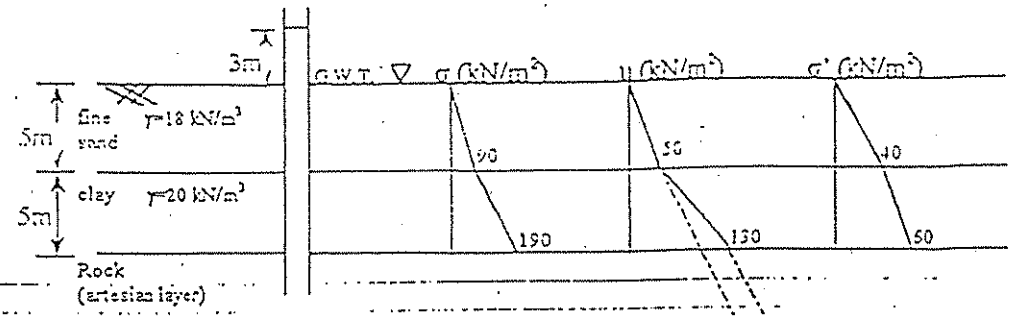
CE 363 – 364

B.1)



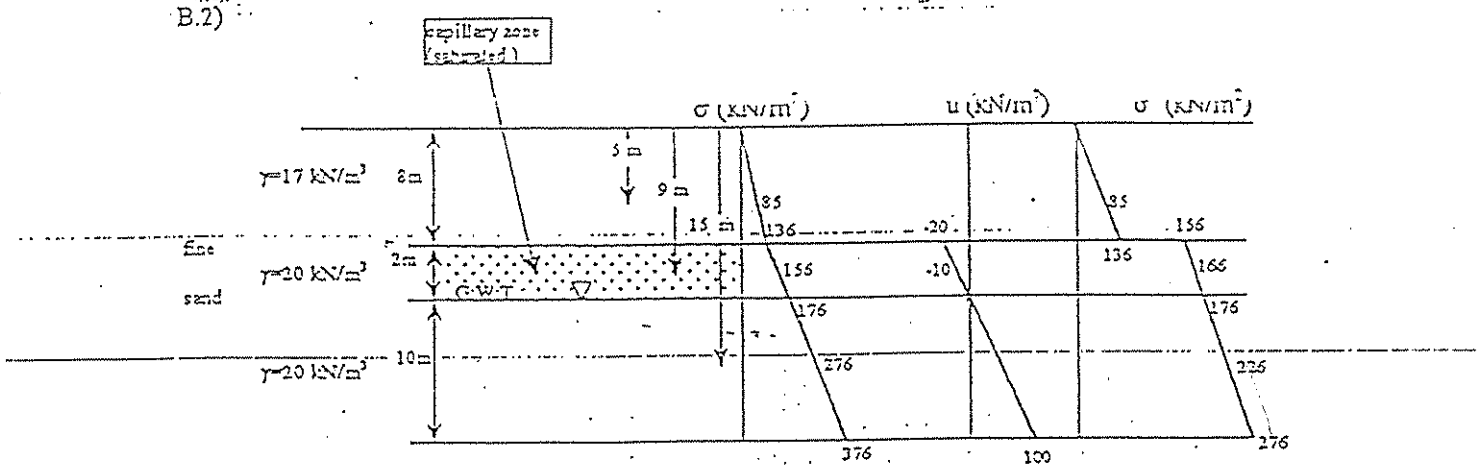
At 5 m ⟹ $\sigma = 5*18 = 90\ kN/m^2$ $\quad u = 5*10 = 50\ kN/m^2$

$\sigma' = \sigma - u = 40\ kN/m^2$

At 10 m ⟹ $\sigma = 5*18 + 5*20 = 190\ kN/m^2$ $\quad u = 13*10 = 130\ kN/m^2$

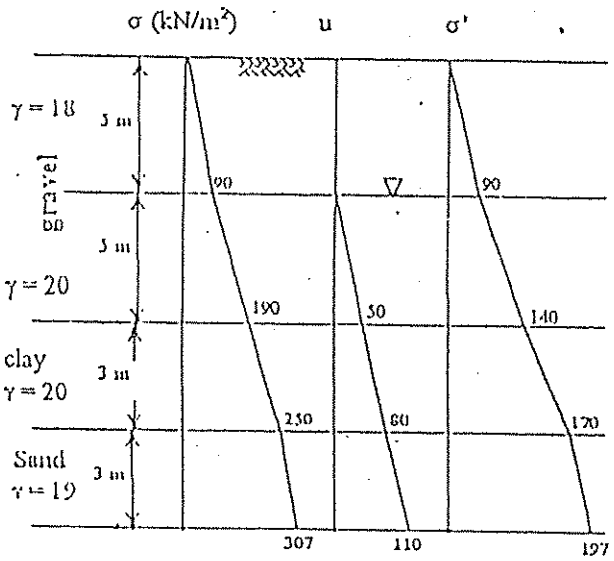
$\sigma' = \sigma - u = 60\ kN/m^2$

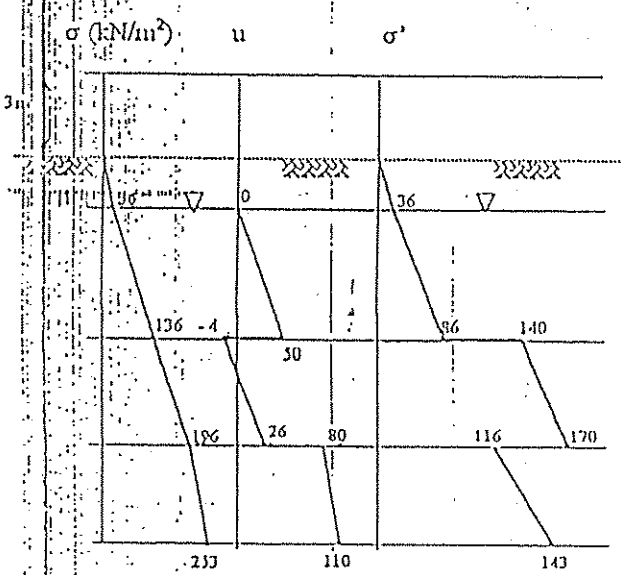
B.2)

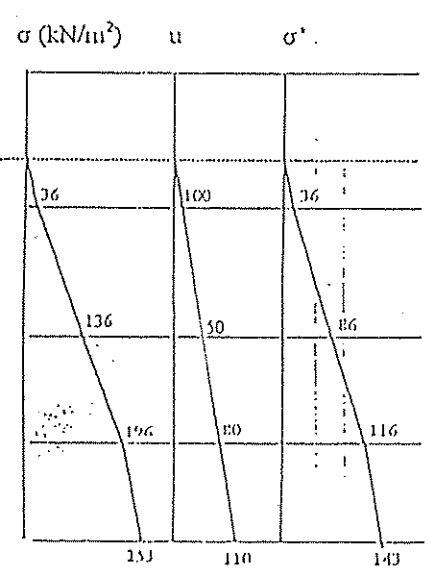


Depth (m)	σ (kN/m²)	u (kN/m²)	σ' (kN/m²)
5	5*17 = 85	0	85 – 0 = 85
9	8*17 + 1*20 = 156	-1*10 = - 10	156 – (-10) = 166
15	8*17 + 7*20 = 276	5*10 = 50	276 – 50 = 226

B3)







3 m. depth of excavation of $\gamma = 18$ kN/m³ soil : $\Delta\sigma = 3*18 = (-)54$ kN/m²

in low permeability soils (e.g. clay) for short term (immediately after) effective stress doesnot change !!!

$$\boxed{\Delta\sigma = \Delta u \quad \& \quad \Delta\sigma' = 0}$$

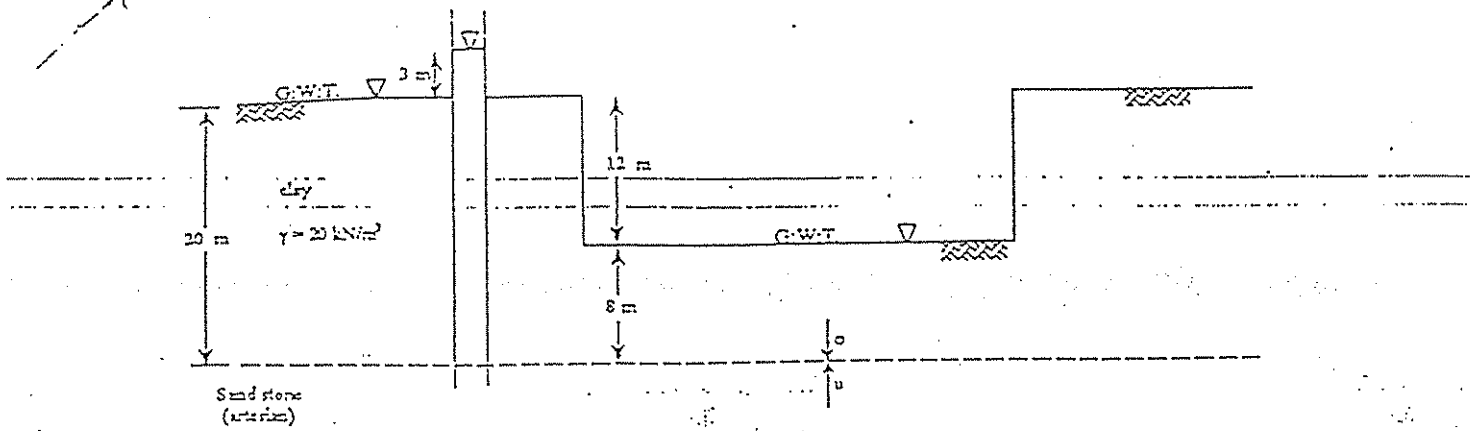
G.W. lowering : $\Delta\sigma = -54 + [-x*(20-18)] = \Delta u$

(exc.) (γ_{change})

$u_{clay} = u_{initial} + \Delta u$

$u_{clay\ top} = 50 + (-54) = -4$

$u_{clay\ bottom} = 80 + (-54) = 26$



Heave of bottom of excavation (blowing, lifting)

$\boxed{\sigma = u} \Longrightarrow \boxed{\sigma' = 0}$

$s = 20 * 8 = 160\ kN/m^2$

$u = 230\ kN/m^2 >> 160\ kN/m^2$ ... water pressure should not exceed total pressure at that point !

$s = u \Longrightarrow u = 160\ kN/m^2$

$\gamma_w * h_w = 160$

$\boxed{h_w = 16\ m}$

$\Delta h_{required} = 23 - 16 = 7\ m.$

$\Longrightarrow$ Artesian level should be lowered by 7 m. !