University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011

Subject :Earth Structure — **Class:4th Year**
Branch : Road & Bridge — **Time : 3 Hours**
Examiner :Dr . Mahmoud R. — **Date :12/ 6 / 2011**

Note : Attempt 5 Questions only

Q1 : Discuss the mechanism of the followings:

a- Using Bitumen as soil stabilizers.
b- Using Portland cement in the stabilization of fine grained soils.
c- Lowering of ground water table as a temporary improvement of soil.
d- Preloading technique for improving soft saturated soil. (20 mark)

Q2: a- Suggest and discuss two methods to improve a soil bed of 15m depth of saturated loose sand. (10 mark)

b- For the following deep stabilization methods specify type and depth of soil bed.
Grouting, Stone column, Earth reinforcement, Soil nailing, Micro piles
(10 mark)

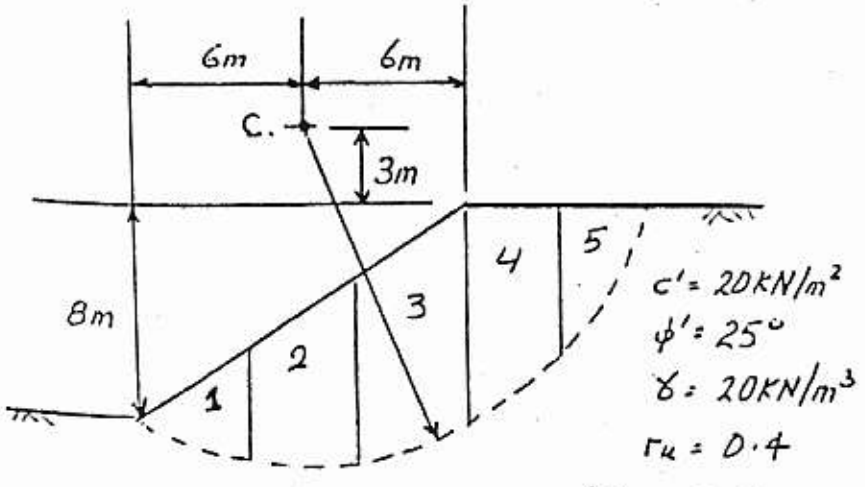
Q3: A- An embankment has a slope of 1 vertical to 2 horizontal. The properties of the soil are : $C=25kN/m^2$,$\varphi=20^o$, $\gamma=16\ kN/m^2$, and H=37m. Using Taylor's curves, determine the factor of safety F value for the slope. (10 mark)

B- According to filter design criteria there are two main conditions and four requirements must be met to satisfy these conditions. What are the conditions and the requirements? (10 mark)

Q4- For a given failure surface shown in fig(1) determine the factor of safety for the slip circle shown in term of effective stresses using the following expression:

$$F=\frac{1}{\Sigma W\sin\alpha}\Sigma[c'l + W(\cos\alpha - r_u \sec\alpha)\tan\varphi']$$

(20 mark)



fig(1)

Q5 : Refer to the braced cut shown in fig.(2)

Given $\gamma = 18\ kN/m^3$, $\varphi = 32^\circ$, and $C = 0$.

The struts are located at 4m c/c in the plan

Draw the earth pressure envelope and determine the strut loads at levels A, B and C. Then determine a design section for the Wales at level B If σ_{all}=150MPa (20 mark)

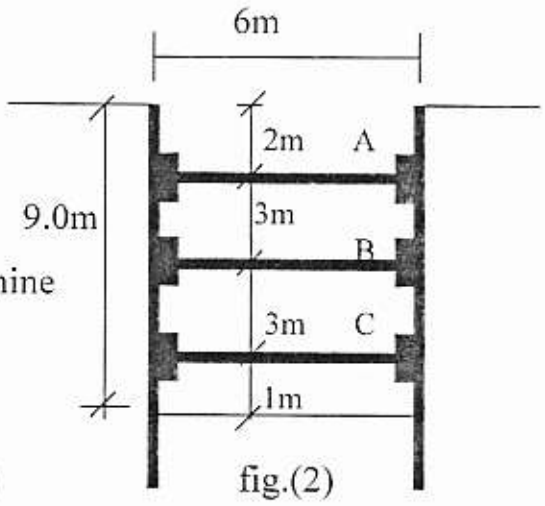


fig.(2)

Q6- A- For the gravity retaining wall shown in fig (3) with the horizontal backfill. Find the max. pressure under the toe. (10 mark)

B- For the retaining wall shown in fig (4).If $\varphi=30^\circ$, find the width (B) such that $(F.S)_{sliding} = (F.S)_{overturning}$ (10 mark)

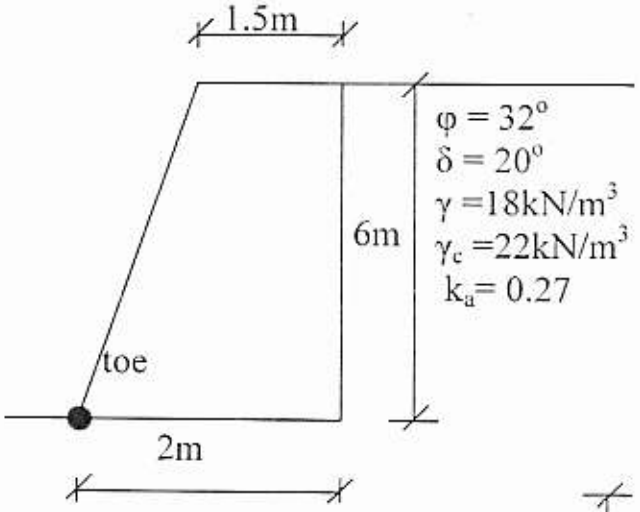


Fig (3)

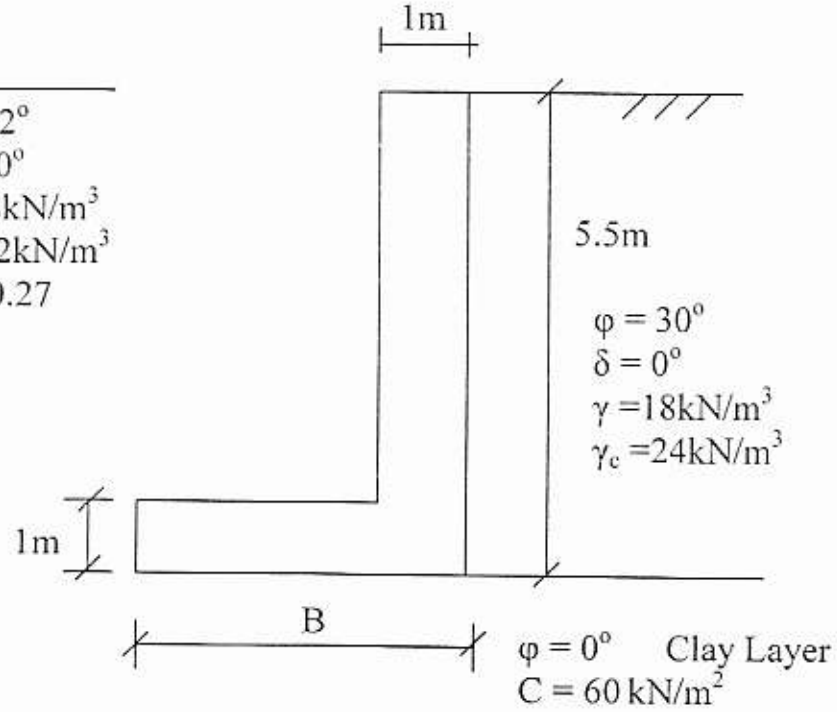
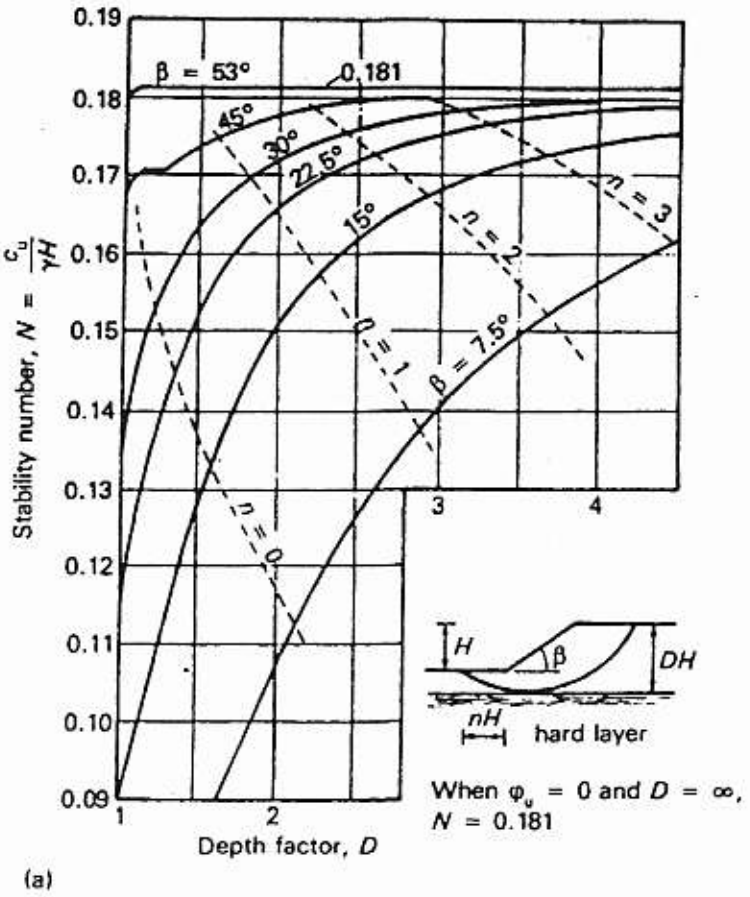
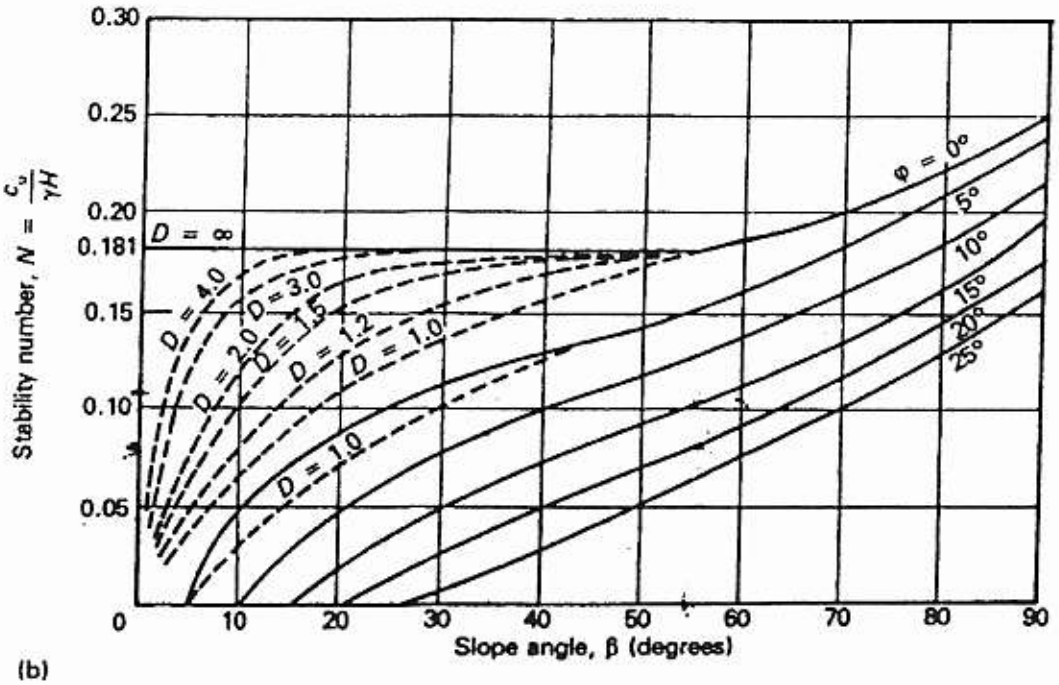


Fig (4)



(a)



(b)

Fig. 9.20 **Taylor's stability number charts**
(*a*) $\phi_u = 0$ case (*b*) $\phi > 0$ case