**Course No:** CIVL 4323
**Course Title:** Foundation Engineering
**Date:** 17/1/2017
**No. of Questions:** (3)
**Time:** 2 hr
**Using Calculator** (Yes)

**University of Palestine**

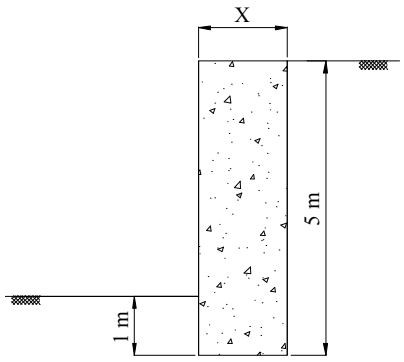
**Final Exam**
**First Semester**
**2017/2018**
**Total Grade: 50**

**Instructor Name:** Dr. Sari Abusharar
**Student No.:** _____
**Student Name:** _____
**College Name:** Engineering
**Dep. / Specialist:** Civil Engineering
**Using Dictionary** (No)

**Answer All Questions**

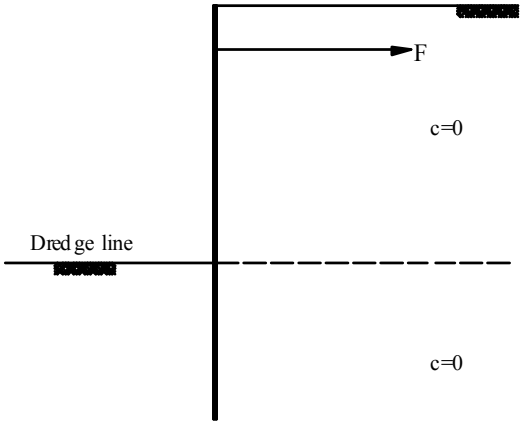
## First Question 10/50

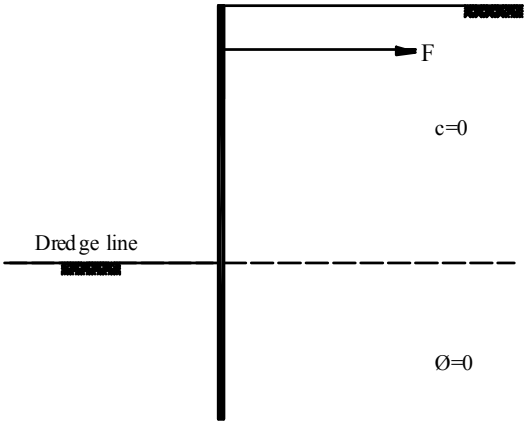
A gravity retaining wall shown in the figure below is required to retain 5 m of soil. The backfill is a granular soil with unit weight, $\gamma$ =18 kN/m$^3$, and friction angle of $\phi$=30$^o$. The existing soil below the base has the following properties: $\gamma$=19 kN/m$^3$, $\phi$=36$^o$ and c = 40 kN/m$^2$. The wall is embedded 1m into the existing soil. Determine the value of X in meter that achieves a factor of safety equals 2 with respect to overturning assuming that there is no friction between the soil and the wall. Use $\gamma_{concrete}$ = 24 kN/m$^3$.

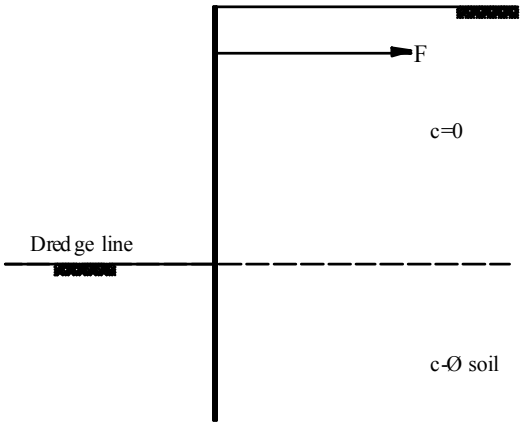


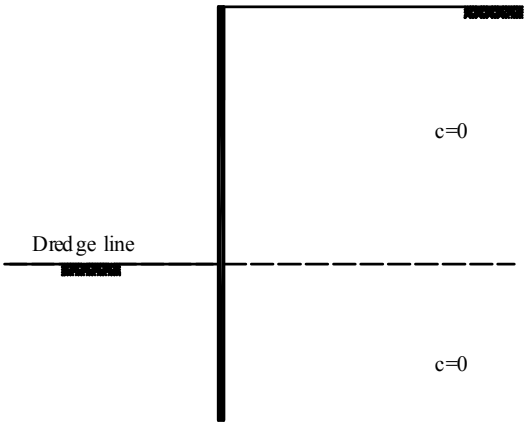
## Second Question 10/50

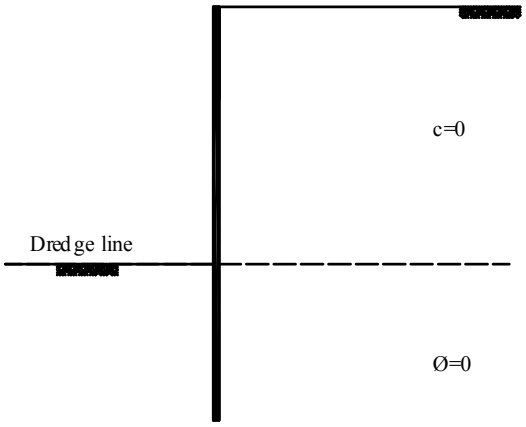
Draw the lateral earth pressure distribution diagram for the following cases.



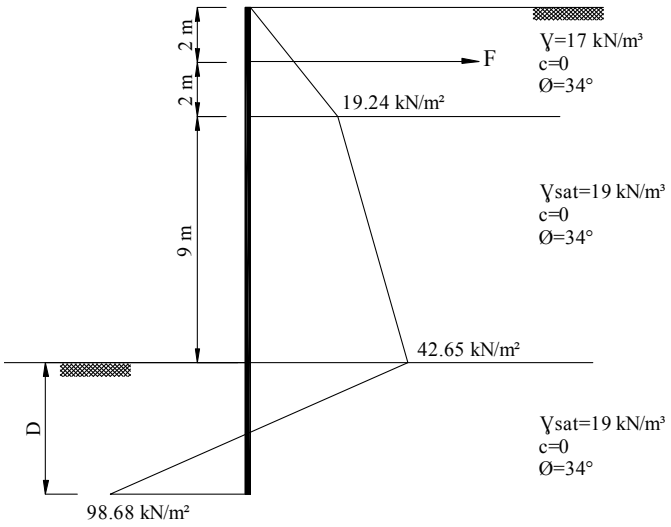
## Third Question 15/50

The lateral earth pressure distribution with depth of an anchored sheet-pile bulkhead is give below. Use the free earth support method to:

a. Determine the theoretical depth of embedment, D.

b. Calculate the anchor force per unit length of the sheet-pile wall, F.

c. Calculate the maximum moment, $M_{max}$.



**Course No:** CIVL 4323
**Course Title:** Foundation Engineering
**Date:** 17/1/2017
**No. of Questions:** (3)
**Time:** 2 hr
**Using Calculator** (Yes)

**University of Palestine**

**Final Exam**
**First Semester**
**2017/2018**
**Total Grade: 50**

**Instructor Name:** Dr. Sari Abusharar
**Student No.:** _____
**Student Name:** _____
**College Name:** Engineering
**Dep. / Specialist:** Civil Engineering
**Using Dictionary** (No)

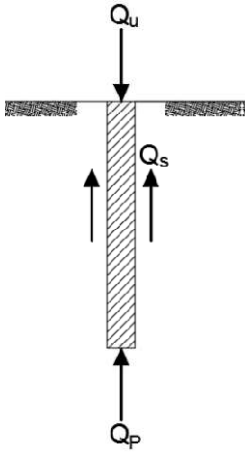
## Fourth Question 15/50

A 30-m long concrete pile is 350 mm x 350 mm in cross section and is fully embedded in a sand deposit. If $\gamma = 16.8$ kN/m$^3$, $N_q^* = 143$, and $\phi = 35°$, calculate:

a) The ultimate load ($Q_p$), by using Meyerhof's method.

b) Determine the frictional resistance ($Q_s$), if $k = 1.2$ and $\delta = 0.8\phi$.

c) Estimate the allowable load carrying capacity of the pile, use FS = 4.



***End of Questions***
***Good Luck***

## *Useful Formulae*

$$\Delta\sigma'_D = \frac{P}{A} = \frac{P}{(B+D)\times(L+D)}$$

$$FS_{(overturning)} = \frac{\Sigma M_R}{\Sigma M_o}$$

$$FS_{(sliding)} = \frac{(\Sigma V)\tan(k_1\phi'_2) + Bk_2c'_2 + P_p}{P_a\cos\alpha}$$

$$Q_P = A_P \times q' \times N_q^* \leq Q_L$$

$$Q_L = 0.5 \times A_P \times p_a \times N_q^* \times \tan\phi$$

$$Q_s = P \times \sum \tan(0.8\phi_i) \times \sigma'_{v,av,i} \times K_i \times L_i$$