THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING AND CIVIL ENGINEERING
(HD/BC/09)

END OF COURSE EXAMINATIONS

APRIL/MAY 2010 SERIES

EB 2316: FOUNDATION ENGINEERING I

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination:

- Answer Booklet
- Scientific Calculator

This paper consists of **FIVE** Questions.
Answer Question **ONE** (which is compulsory)and any other **TWO** Questions.
Maximum marks for each part of a question are as shown.

Question ONE (Compulsory)

(a). The soil conditions adjacent to a sheet pile wall are given in figure 1, a surcharge pressure of 50KN/m^2 being carried on the surface behind the wall. For soil 1, a sand above the water table, $C'=0,\ \phi'=38°\ and\ \gamma=18KN/m^3,\ \phi=28°\ and\ \gamma_{sat}=20KN/m^3$. Plot the distributions of active pressure behind the wall and passive pressure in front of the wall. **(14½ Marks)**

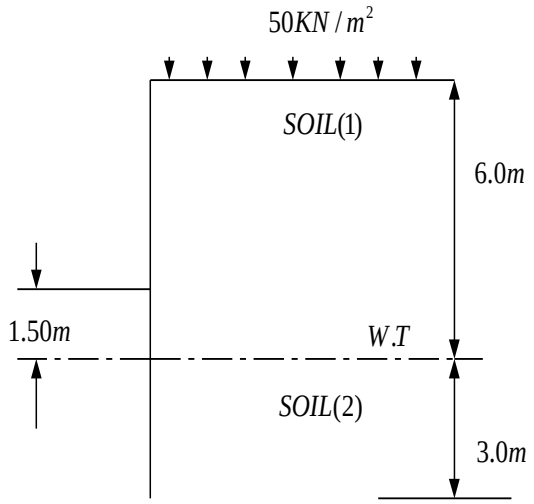

Fig. 1

(b). Using a sketch, outline the procedure for estimating the preconsolidation pressure for an overconsolidated clay. **(9 Marks)**

(c). A footing 2.25m square is located at a depth of 1.5m in a sand, the shear strength parameters being $C'=0,\ \phi'=38°$. Determine the ultimate bearing capacity:

(i). If the water table is at the surface.
(ii). If the water table is well below foundation level.

Take $\gamma=18KN/m^3,\ \phi=28°\ and\ \gamma_{sat}=20KN/m^3$. **(6½Marks)**

Question TWO

(a). Outline the effect on settlement by the following factors, stating measures to be taken where applicable:
(i). Vegetation
(ii). Ground water lowering
(iii). Temperature change **(14 Marks)**

(b). The following compression readings were taken during an Oedometer test on a saturated clay specimen (G_s=2.73) when the applied pressure was increased from 214 to 429KN/m^2.

Time (min)	0	$\frac{1}{4}$	$\frac{1}{2}$	1	$2\frac{1}{4}$	4	9	16	25
Gauge (mm)	5.00	4.67	4.62	4.53	4.41	4.28	4.01	3.75	3.49

Time (min)	36	49	64	81	100	200	400	1440
Gauge (mm)	3.28	3.15	3.06	3.00	2.96	2.84	2.76	2.61

After 1440min the thickness of the specimen was 13.60mm and the water content 35.9%. Determine the coefficient of permeability. Take $C_V = 0.45m^3/yr$. **(6 Marks)**

Question THREE

(a). With the aid of sketches, outline the **THREE** modes of shear failure below footings. **(13½ Marks)**

(b). A square footing of sides 1.2m x 1.2m is founded on sand of density 1800kg/m^3. The angle of internal friction is 36^o. If $N\gamma = 50$ *and* $N_q = 43$, determine the ultimate bearing capacity when the footing is:

(i). On the ground surface
(ii). at a depth of 1.5m below the ground surface. **(6½ Marks)**

Question FOUR

(a). Derive the expression for active lateral earth pressure. **(8 Marks)**

(b).

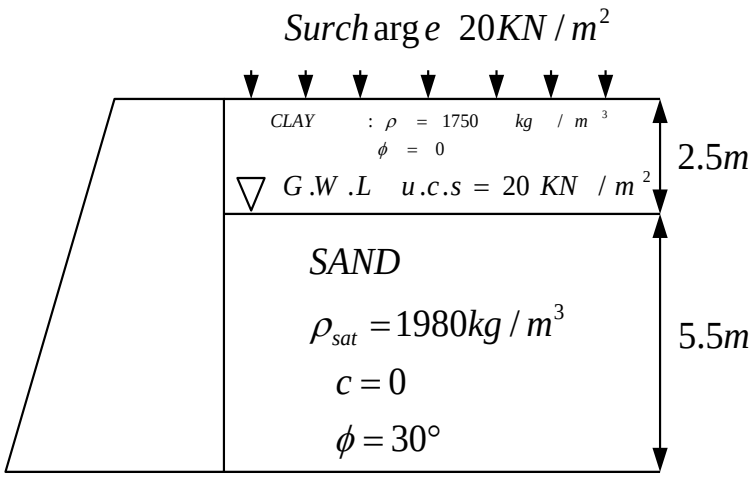

Fig. 2

(8 Marks)

Figure 2 shows the backfill behind a smooth vertical retaining wall.

(i). Assuming no tension cracks develops; determine the shear force in KN which must be mobilized beneath the base of the wall to prevent movement away from back fill.

(ii). Determine the line of action of the resultant thrust. **(12 Marks)**

Question FIVE

(a). State **FIVE** assumptions made in Terzaghi's theory of one-dimensional consolidation. **(5 Marks)**

(b). A retaining wall with a smooth vertical back supports soil for a depth of 9.5m, which has the following properties:

$C' = 24KN/m^2$,

$\phi' = 13.5°$

$\gamma = 18KN/m^3$

Calculate the active thrust when there is a surface surcharge of 50KN/m^2. **(5½ Marks)**

(c). During a consolidation test, a sample of fully saturated clay soil 30mm thick was consolidated under a pressure increment of 196.2KN/m^2. At the end of the experiment the sample thickness was 26mm. While being allowed to expand the sample thickness increased to 28mm and its moisture was 24%. Determine the void ratio before and after consolidation. Take specific gravity of particles as 2.70. **(9½ Marks)**