TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2414: FOUNDATION ENGINEERING II

SPECIAL/SUPPLEMENTARY EXAMINATION
**SERIES:** SEPTEMBER 2018
TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATE:

1. You should have the following for this examination:
     - **Answer booklet.**
     - **Mathematical Table/Pocket Calculator.**
2. This paper consists of **FOUR** questions.
3. Answer question **ONE (Compulsory)** and any other **TWO** questions.
4. This paper consists of **FIVE** printed pages.
5. **Do not write on the question paper.**

Question one (COMPULSORY) 30 Marks

Figure 1.1 shows a braced cut. The struts are located at 4 m centres on plan.

Wales — Strut —

5.0 m

2.0 m   A

3.0 m   B

3.0 m

C

1.0 m
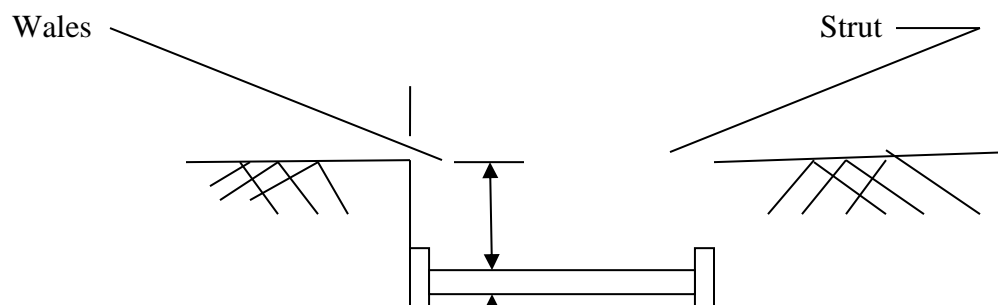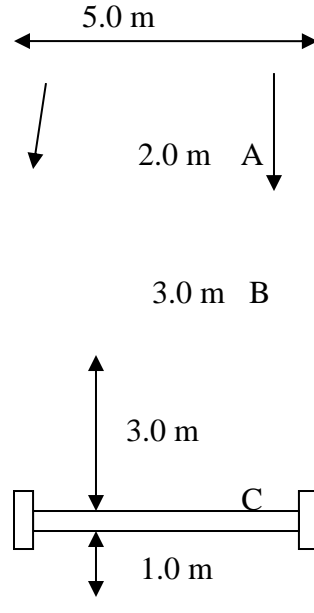
Unit weight = 17.6 kN/m^3

Cohesion C = 0 kN/m^2

Internal friction $\varphi = 32°$

Fig. 1.1: Braced cut

Determine:

    (i)   The earth pressure envelope
    (ii)   The strut design loads at levels A, B, and C,
    (iii)   The required sheet pile section modulus (use $\sigma_{allowable} = 170 \times 10^3$ kN/m^2)
    (iv)   The required section modulus of the wales at level A ($\sigma_{allowable} = 173 \times 10^3$ kN/m^2)

(30 marks)

Question Two

(a) Mention and briefly explain any four types of footings.

(10 marks)

(b) Figure 2.1 shows a foundation beam with vertical loads and a moment. The width of the beam is 0.70 m and depth 0.50 m. A uniform load of 16 kN/m (including self weight) is imposed on the beam. Determine the:

    (i) Base pressure distribution,

(ii) Shear force diagram,

(iii) Bending moment diagram.
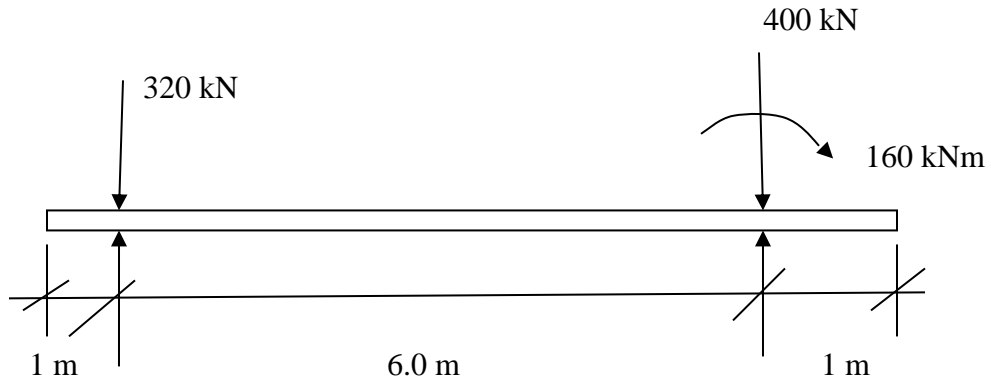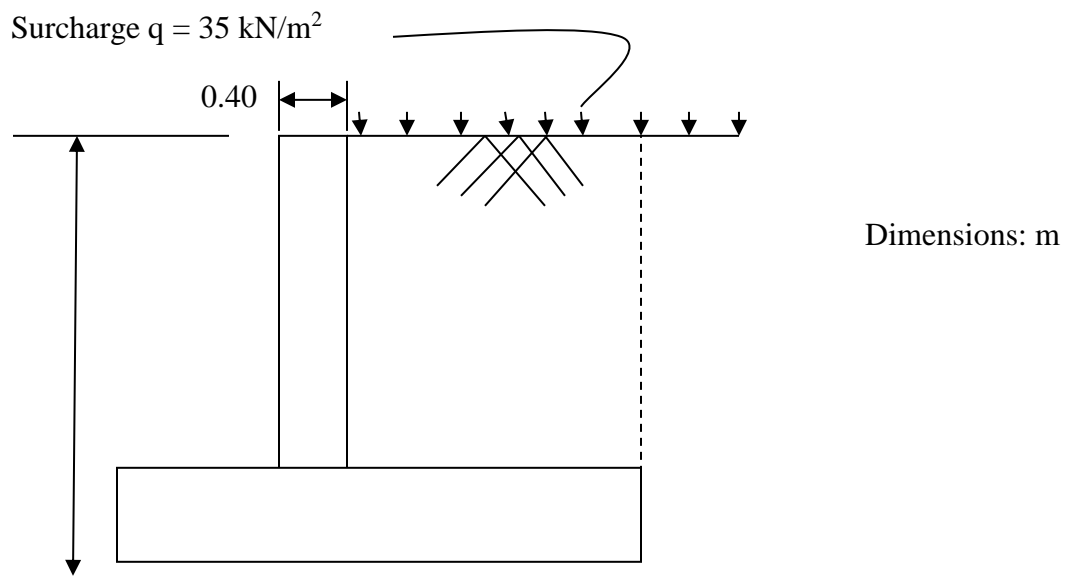
400 kN

320 kN

160 kNm

1 m   6.0 m   1 m

Figure 2.1: Beam with vertical loads and a moment

Question Three

A section of a cantilever retaining wall is shown in Figure 3.1.

Surcharge q = 35 kN/m^2

0.40

Dimensions: m

6.0   2.0

                                               0.5

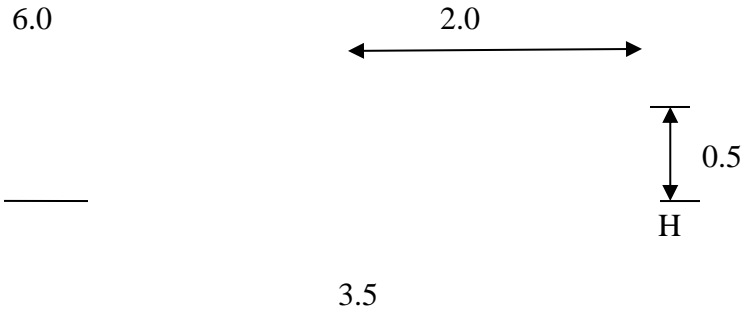   H

             3.5

Figure 3.1: Cantilever retaining wall (concrete both stem and base: Unit weight $= 24$ kN/m^3)

The backfill has the following properties: Cohesion $C = 0$ kN/m^2, Internal friction $\varphi = 41°$, Unit Weight $= 16.0$ kN/m^3, Angle of friction between the base and the soil $\delta = \frac{2}{3}$ (φ), safe bearing capacity of the soil $= 200$ kN/m^2. Check the stability of the wall against:

    (i)   Soil bearing pressure,
    (ii)   Sliding.

(20 marks)

Question Four

    (a) State and explain any five information items of a site investigation report.

(10 marks)

    (b) Discuss soil exploration under the following sub-headings:
        (i)   Trial pits,
        (ii)   Adits,
        (iii)   Percussion boring,
        (iv)   Augers ,
        (v)   Rotary drilling

(10 marks)