



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
FOURTH YEAR SECOND SEMESTER EXAMINATION
BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 411: FOUNDATION ENGINEERING II

DATE: 20/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

ATTEMPT QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Describe types of combined footings indicating when and where each is required (6 marks)
- b) List the types of anchors as use in sheet pile walls (2 marks)
- c) What is the difference between retaining walls and sheet pile wall? (4 marks)
- d) Outline the factors considered when designing a caisson (4 marks)
- e) Briefly discuss what a coffer dam is and its purpose (3 marks)
- f) Design a reinforced concrete footing to carry a (50x50 cm) with 2.5MN load. The allowable soil pressure is 250kN/m². Assume effective depth of 625mm (6 marks)
- g) What is the difference between a pier and a caisson? (5 marks)

QUESTION TWO (20 MARKS)

- a) Design a strap footing for two columns (30x30cm) carrying loads of 1.2 MN (internal column) and 0.90 MN (external column), if the spacing between two columns is 5m. Take allowable soil pressure as 200 kN/m² and the length of the footing is 5m and eccentricity of the footing of external column as 1m (10 marks)
- b) Discuss different types of sheeting and bracing systems (10 marks)

QUESTION THREE (20MARKS)

- a) For the cantilever retaining wall shown in Figure 1 below. Calculate the factor of safety for overturning, sliding and bearing capacity. If unit weight of concrete is $\gamma = 24 \text{ kN/m}^3$, active force $P_a = 161.2 \text{ kN}$ angle of friction 24° , allowable soil bearing capacity 566 kN/m^2 (10 marks)

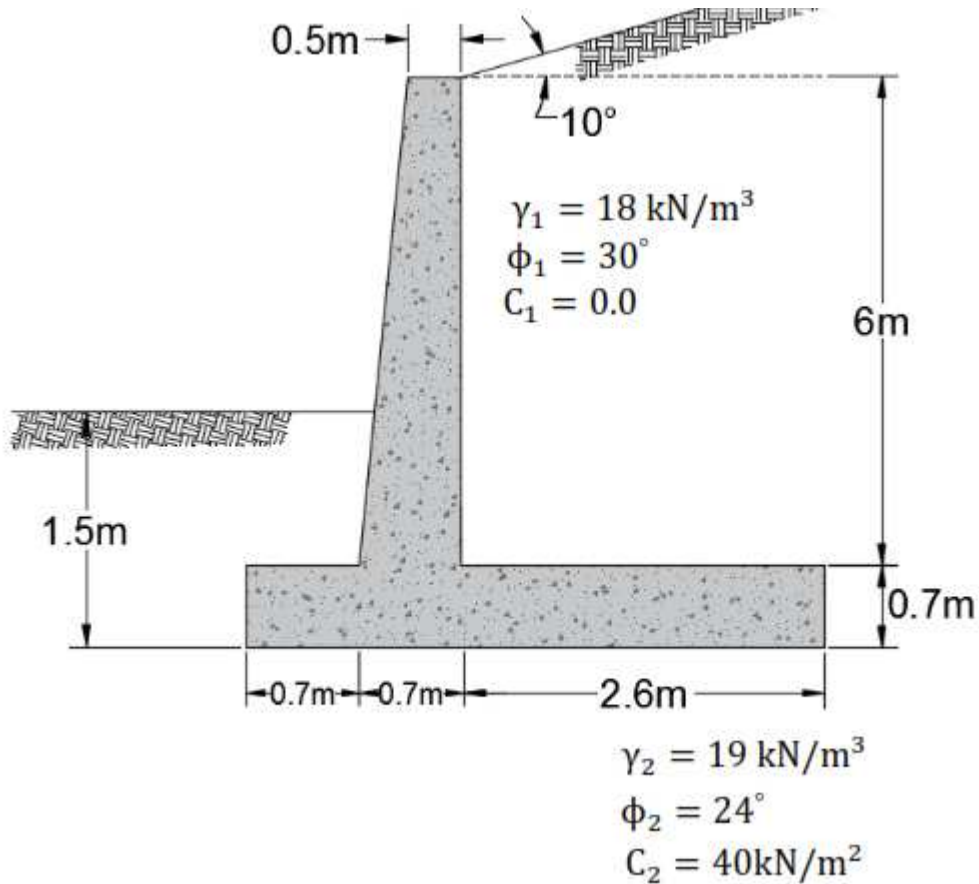


Figure 1

- b) Briefly discuss types of caissons (6 marks)
- c) State four advantages and disadvantages of drilled piers (4 marks)

QUESTION FOUR (20MARKS)

- a) The plan of a mat foundation with 9 columns is as shown in the Figure 2 below. Assuming the mat is rigid, determine the maximum bending moment and shear force for critically loaded strip. All columns are of the size $0.8\text{m} \times 0.8\text{m}$ (15 marks)

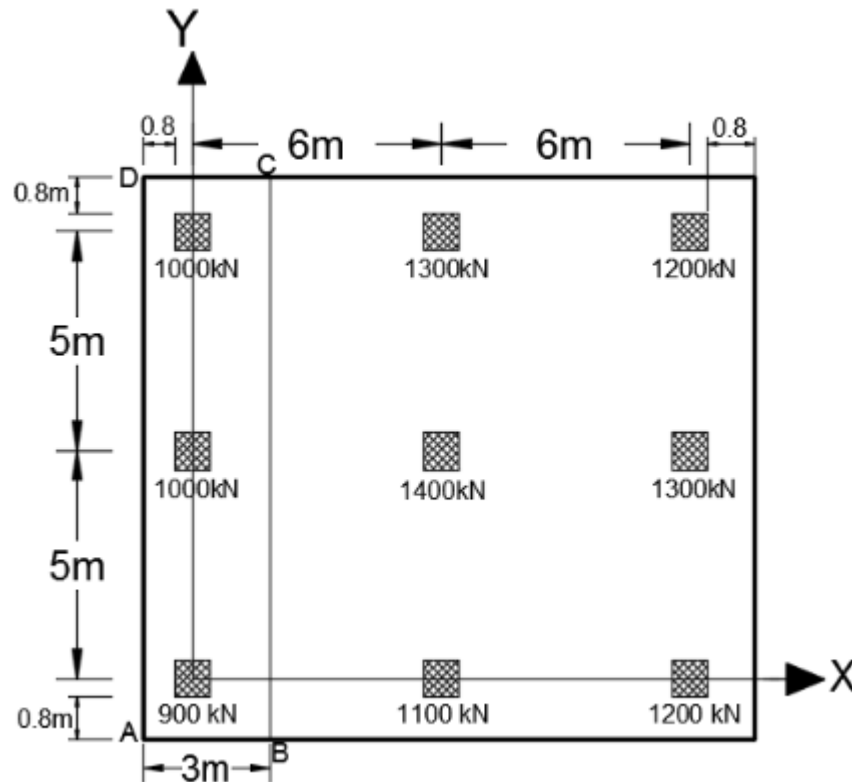


Figure 2

- b) State five advantages and disadvantages of Pneumatic caissons (5 marks)