



TECHNICAL UNIVERSITY OF MOMBASA  
**Faculty of Engineering &  
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING  
**UNIVERSITY EXAMINATION FOR:  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING  
(BSCE)**

ECE 2406: FOUNDATION ENGINEERING I

**END OF SEMESTER EXAMINATION  
SERIES: APRIL 2014  
TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- Answer booklet

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

All questions carry equal marks

Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

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**Question One (COMPULSORY)**

- a) With the aid of an illustration, state the principal types of rigid retaining walls. **(10 marks)**
- b) Using a well labelled diagrams, give the purposes of retaining walls. **(12 marks)**
- c) Define the following terms as used in foundation engineering
- (i) Retaining walls
  - (ii) Angles of wall friction
  - (iii) Underpinning

(iv) Shoring

(8 marks)

- d) A rigid retaining wall 5m high supports a backfill of cohesionless soil with  $V = 30^\circ$ . The water table is below the base of the wall. The backfill is dry and has a unit weight of 18KN/m<sup>3</sup>. Determine Rankine's Passive earth pressure per meter length of the wall. (10 marks)

### Question Two

- a) Using well labelled illustrations, differentiate between passive and active pressures explaining briefly their actions on wall. (10 marks)
- b) State the reason for underpinning and hence give the general precautions undertaken before the underpinning works is done. (10 marks)

### Question Three

- a) Briefly explain using illustrations the following:  
(i) Dead shores  
(ii) Raking shoring  
(iii) Flying shoring (10 marks)
- b) Explain the gradual decrease and increase of pressure on walls with the movement of the wall from the rest condition. Use an illustration. (10 marks)

### Question Four

- a) A cantilever retaining wall of 7 meters height retains sand. The properties for sand are  $e = 0.5$ ,  $\theta = 30^\circ$  and  $G = 2.7$ . Using Rankine's theory determine the active earth pressure at the base when the backfill is:  
(i) Dry  
(ii) Saturated  
(iii) Submerged

And also the resultant active force in each case. In addition, determine the total pressure under the submerged condition. (16 marks)

- b) Draw a diagram to illustrate the lateral earth pressures for a rest condition. (4 marks)

### Question Five

- a) State the assumptions made by Coulomb in the development of his theory: (7 marks)
- b) Using a well labelled illustration explain the conditions for failure under active conditions. In the illustration show:  
(i) Retaining wall  
(ii) Polygon of forces (13 marks)