TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE 13M 12JA)

ECE 2311: SOIL MECHANICS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JUNE/JULY 2015

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Pocket Calculator*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
Use neat, large and well labeled diagrams where required
This paper consists of **TWO** printed pages

Question One

a) Using illustrations, outline the important factors that can cause instability and lead to slope failure **(5 marks)**

b) A concentrated load of 1500KN is applied at the ground surface, compute the vertical pressure:
   (i) At a depth of 6m below the load
   (ii) At a distance of 4m at the same depth **(4 marks)**

c) Determine, by Culmann's method, the critical height of an embarkment having a slope angle of 40^o $\phi^2 = 20^o$ and the constructed soil having C' = 630kg/m^2, and effective unit weight = 114kg/m^3. Find $F_C = F\phi = 1.25$ the allowable height of the embarkment if Fc = **(8 marks)**

d) Determine the shearing strength of soil along a horizontal plane at a depth of 6m in a deposit of sand having the following properties; angle of internal friction $\phi = 35^o$ dry unit weight d = 17KN/m^3 and specific gravity, G = 2.7.
Assume the ground water table is at a depth of 3m below ground surface. Also find the change in shear strength when the water table rises to the ground surface. **(8 marks)**

e) Briefly discuss the assumption considered when computing stresses using boussinesq's formula **(5 marks)**

Question Two

a) Using illustrations, discuss the different types of circular surfaces failure **(10 marks)**

b) Compute the factor of safety of a slope of infinite extent having a slope angle = 25^o. The slope is made up of cohesionless soil with $\phi = 30^o$ **(2 marks)**

c) Analyze the same slope if it is made of clay having C' = 30KN/m^2, $\phi' m = 20^o,\ e = 0.65$ and Gs = 2.7, under the following conditions:
(i) When the soil is dry **(4 marks)**
(ii) When water seeps parallel to the surface of slope **(2 marks)**
(iii) When the slope is submerged **(2 marks)**

Question Three

a) The footings of sizes 4m x 4m and 3m x 3m are placed 9m centre to centre apart at the same level and carry loads of 150kg and 120kg respectively. Compute the vertical pressure at a depth of 4max point C midway between the centres of the footings **(10 marks)**

b) Define the following soil mechanics terms:
(i) Angle of obliquity
(ii) Principal plane
(iii) Shear strength
(iv) Cohesion **(4 marks)**

c) Explain the shearing characteristics of a soil **(6 marks)**

Question Four

a) ABCD is a raft foundation of a multi-storey building wherein AB = 18m and BC = 10m. The uniformly distributed load q over the raft is 1000KN/m^2. Determine $AA_1 = 4m$ and $A_1 0 = 6m$ (Use chart II) **(10 marks)**

b) Define soil stabilization and briefly highlight the various types of admixtures used in soil stabilization **(10 marks)**

Question Five

a) Outline the three parts to an analysis of the stability of a slope. **(10 marks)**

b) Calculate the factor of safety (i) with respect to strength.
(ii) With respect to cohesion and;
(iii) With respect to friction for a soil whose shearing strength parameters are C' = 26.7KN/m^3, $\phi = 15^o$ $\phi_m = 12^o$, C'm = 17.8KN/m^2 and The average integranular pressure σ of the failure surface is 102.5KN/m^2. What happens when;

(i) Factor of safety with respect to cohesion is unity?

(ii) Factor of safety with respect to friction is unity **(10 marks)**