



MACHAKOS UNIVERSITY

University Examination 2019/2020

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN BUILDING CONSTRUCTION

BCE CD 303: SOIL MECHANICS II

DATE: 4/12/2019

TIME: 8.30-10.30 AM

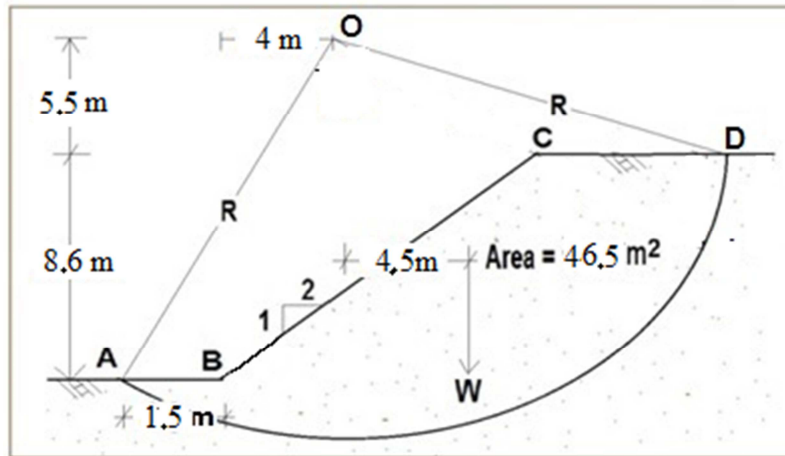
INSTRUCTIONS

Answer Question ONE(Compulsory) and any other TWO questions

Maximum marks for each part of a question are as shown

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Explain effect of seepage in slope instability. (4 marks)
- b) Distinguish Rotational slips from compound slides in slope failure. (4 marks)
- c)
 - i Explain the term 'Preliminary stage' as applied to site investigation.
 - ii Outline **FOUR** aims for carrying out site investigation for a route that is proposed for construction of a highway. (6 marks)
- d) Briefly explain **FOUR** main methods that can be used in soil conservation. (8 marks)
- e) A cohesive soil mass has a slope cut in a soil of unit weight 18.5KN/M^3 . The undrained strength of the soil as shown in figure 1 is 33 KN/M^2 . Determine factor of safety for the soil mass. (8 marks)

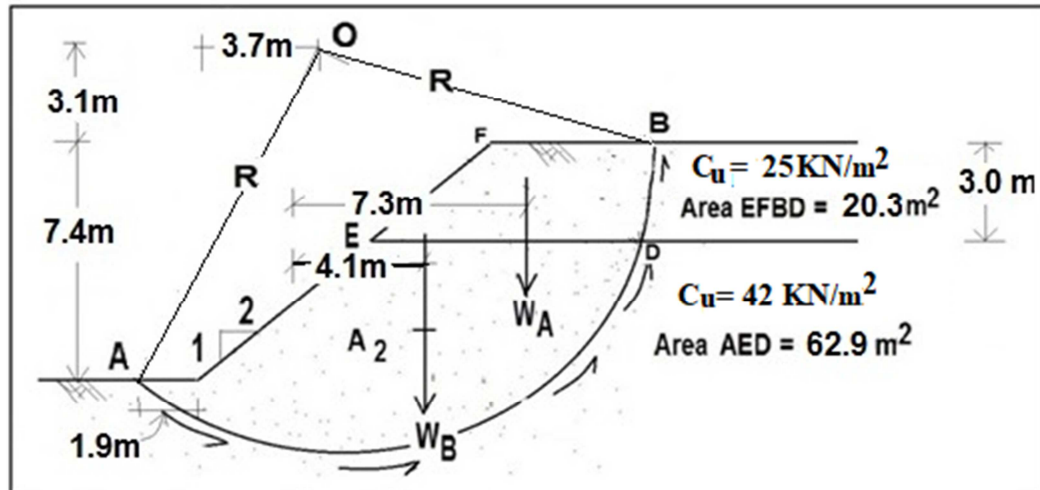


QUESTION TWO (20 MARKS)

- a) Outline **FOUR** purposes for site investigation. (8 marks)
- b) Slip movement occurred for a granular soil layer sloping surface 5m thick. The layer has a slope angle of 13° . Assuming a waterlogged ground and seepage occurring parallel to the ground surface, determine the value of θ' for the soil considering $\gamma_{sat} = 21\text{KN/m}^3$. (4 marks)
- c) Briefly explain the following:
 - i. Influence of topography on soil erosion.
 - ii. Use of riprap material in soil conservation.
 - iii. Vegetation cover in soil erosion (8 marks)

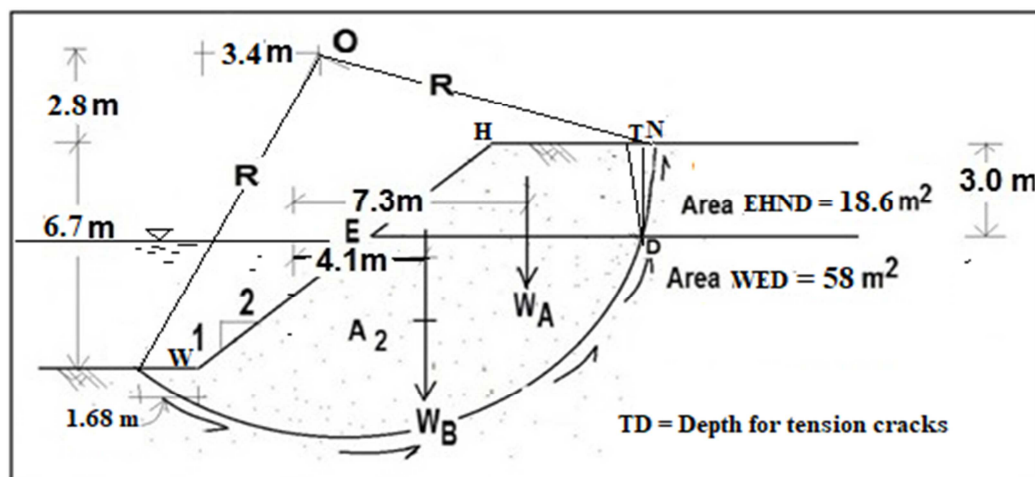
QUESTION THREE (20 MARKS)

- Outline a typical method for obtaining undisturbed soil samples. (6 marks)
- Briefly explain the effect of lime in stabilization of soils. (6 marks)
- A saturated soil slope for two soil layers under undrained conditions is as shown in figure 2. The unit weight for upper and lower soil layers are 18.4 kN/m^3 and 19.7 kN/m^3 respectively. Determine factor of safety if tension cracks formed but are empty. (8 marks)



QUESTION FOUR (20 MARKS)

- Outline **ONE** typical application of Geosynthetic clay liners (4 marks)
- Briefly explain **FOUR** factors that contribute to soil erosion by surface run-off. (8 marks)
- Figure 3 shows a cross section of a cutting for a canal in a cohesive soil. Water in the canal is risen to the level as shown. Unit weight and cohesion of the soil are 19.8 KN/M^3 and 42 KN/M^2 respectively tension cracks formed are filled with pore water, determine factor of safety. (8 marks)



QUESTION FIVE (20 MARKS)

a) i State **FOUR** limitations for seismic refraction method that is applied in site investigation.

ii Distinguish Percussion from Rotary drilling systems based on operation principles. (8 marks)

a) State SIX possible activities that apply to site reconnaissance (6 marks)

b) An extensive slope consists of granular soil 4.7 m thick inclined at a slope angle of 15° . A hard impermeable layer underlies the soil parallel to the ground surface. Characteristics for the soil are;

$$\theta' = 30^{\circ} \quad C' = 0, \quad \text{and} \quad \gamma_{sat} = 21 \text{ KN/M}^3.$$

Determine factor of safety against translational sliding for the following cases:

i. Negligible water in the slope

ii. Waterlogged slope with parallel seepage

iii. Ground water level seeping parallel to the surface at a depth of only 2.2 m below the surface. (6 marks)