MACHAKOS UNIVERSITY

University Examinations for 2019/2020Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 507: GEOTECHNICAL ENGINEERING

DATE: 19/10/2020 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE (COMPULSORY) (20 MARKS)

a) Discuss "Frost Action" in soils and outline how this problem may be solved. (2 marks)

b) State four (4) factors which may influence the choice of tunneling method. (4 marks)

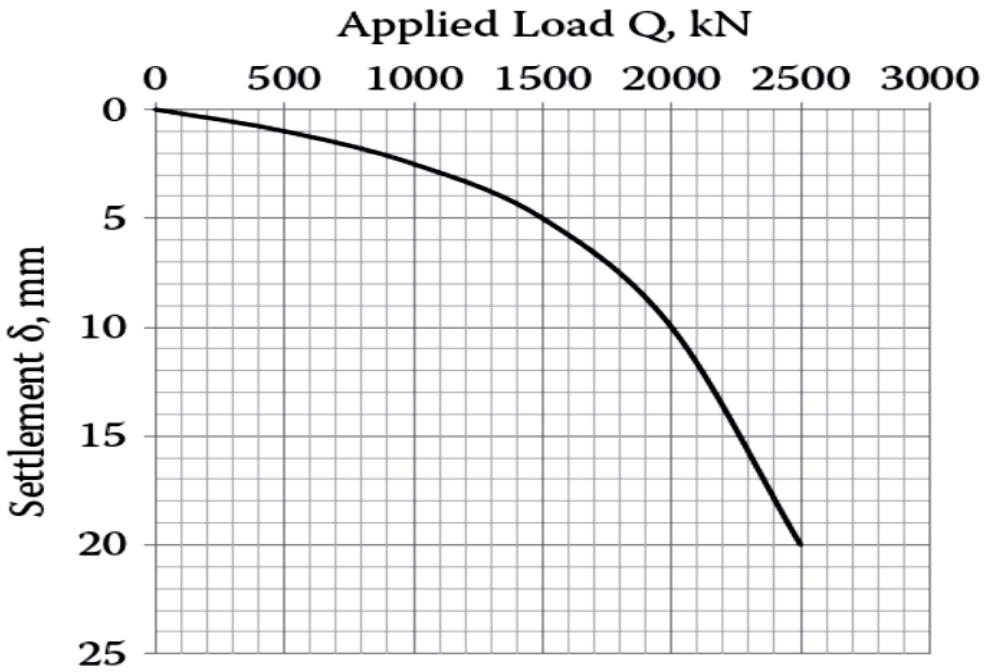
c) Explain four (4) functions of geotextiles when they are incorporated into soil structure. (6 marks)

d) Briefly describe the functions of the different zones of a dam and state the suitable material for constructing each zone. (6 marks)

e) Briefly discuss the significance of the RQD Index, and how it is computed given data from a site investigations (4 marks)

f) Briefly describe any two principal objectives of site investigation. (3 marks)

g) From a pile load test for a 40 m long steel pile with 0.3 m diameter, the Q-δ curve in figure below was obtained. Use Davisson's method to compute the ultimate downward load capacity. E (MPa) = 200000 MPa. (5 marks)



QUESTION TWO (20 MARKS)

a) Define tunneling hazards and briefly explain various forms of tunneling hazards. (6 marks)

b) State five (5) types of soils as determined by particle size and also their classification for the purpose of establishing the abilities to safely carry a load. (4 marks)

c) A reinforced cement concrete pile weighing 30 kN (including helmet and dolly) is driven by a drop hammer weighing 30 kN with an effective fall of 0.9 m. The average penetration per blow is 15 mm. The total temporary elastic compression of the pile, pile cap and soil may be taken as 18 mm. Coefficient of restitution 0.36. Determine the allowable load on the pile with a factor of safety of 2? Use Hiley's formula. (6 marks)

d) Define pile driving and briefly explain at least three methods of pile driving. (4 marks**)**

QUESTION THREE (20 MARKS)

a) Define the following terms used in geomechanical properties of rock discontinuities.

i. Spacing

ii. Persistence

iii. Aperture

iv. Filling (4 marks)

b) Explain three (3) field tests commonly used in surface soil investigation for foundations. (6 marks)

c) Describe any 4 advanced geotechnical site investigation methods. (10 marks)

QUESTION FOUR (20 MARKS)

a) Differentiate surface evaluation from site investigation. (2 marks)

b) State the six (6) common methods which are used to evaluate soils and rocks. (3 marks)

c) Differentiate a dam from a reservoir and explain the two major design considerations that must be employed to safe guard an earth dam from the vulnerable principal risks. (7 marks)

d) A cylindrical specimen of rock 5 cm in diameter and 10 cm in overall length is tested in an unconfined compression tester. The specimen has coned ends and its length between the apices of cones is 7 cm. Find the unconfined compressive strength of the rock, if the specimen fails under an axial load of 465 kN. The change in the length of the specimen at failure is 0.1cm. (8 marks)