



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
SCIENCE AND TECHNOLOGY DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

HIGHER NATIONAL DIPLOMA

IN

CIVIL ENGINEERING

SUBJECT: Geotechnology

PAPER NO: 778/17/S01

DURATION: 3 Hours

MARCH/APRIL 2021 EXAMINATION

REQUIREMENTS

1. Calculator
2. Fadum charts

INSTRUCTIONS TO CANDIDATE

Answer all four (4) questions

This paper consists of 3 printed pages.

QUESTION 1

- a) Explain any four (4) methods of improving the ground i.e. ground improvement methods (10 marks)
- b) A smooth-backed vertical wall is 6m high and retains a soil with a bulk unit weight of $20\text{KN}/\text{m}^3$ and angle of friction, $\phi^1 = 20^\circ$. The top of the soil is level with the top of the wall and its surface is horizontal and carries a uniformly distributed load of 40KPa. Using the Rankine theory, determine the total active thrust on the wall per linear metre of wall and its point of application. (10 marks)
- c) Explain how to construct the following
- i) Mass construction gravity walls (2½ marks)
 - ii) Sheet pile walls (2½ marks)

QUESTION 2

- a) What do you understand about the following terms
- i) Safe bearing capacity (3 marks)
 - ii) Allowable bearing capacity (2 marks)
- b) State any five (5) types of foundations you know (5 marks)
- c) A raft foundation subjects its supporting soil to a uniform pressure of 300KPa. The dimensions of the raft are 6.1m by 15.25m. Determine the vertical stress increments due to the raft at a depth of 4.58m below it.
- i) At the centre of the raft and
 - ii) At the central points of the long edges (15 marks)

QUESTION 3

- a) i) Discuss the differences between consolidation and compaction (5 marks)
- ii) Discuss Terzaghi's theory of consolidation (5 marks)
- b) i) Discuss the types of dam embankments (10 marks)
- ii) Explain the causes of slope failure (5 marks)

QUESTION 4

- a) i) Discuss the different types of earth dam foundations i.e. Diagram Dam. (5 marks)
- ii) What type of foundation is suitable for collapsible salts and soft clays (5 marks)
- b) i) Define pore pressure coefficients (5 marks)
- ii) Explain the application of pore water parameters (10 marks)

...../km