

National University of Ireland, Galway  
OLLSCOIL NA hÉIREANN, GAILLIMH

CHRISTMAS EXAMINATIONS 1<sup>ST</sup> SEMESTER 2002

4th SCIENCE  
ENGINEERING GEOLOGY (GE424)

PAPER ONE

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Time allowed: **1.5** hours.

Answer: **All** questions

You should aim to spend 30 minutes on each section.

**Please use separate Answer Books for each section**

**Section 1. Engineering geology (30 minutes)**

Write illustrated notes using ONE of the following headings:

- Examples of construction techniques used in coastal and river environments.
- Soft ground conditions: types, examples and treatment.
- Factors causing, and mitigation practices for, unstable slopes.

**Section 2. Rock properties and uses (30 minutes).**

**Spend five minutes on each question. Answer all the questions.**

**Answer ALL of the following. Illustrate your answers where appropriate.**

- (a) Give four mechanisms of erosion (sediment transport) and how they affect sediment characteristics.
- (b) What is rock quality designation (RQD) and why is it important?
- (c) How do pressure, temperature and water affect the behaviour of rocks when stress is applied?
- (d) Give three tests for aggregates as road-stone and state what properties of rock they are measuring.
- (e) Briefly describe the features of cement hardening.
- (f) Briefly describe the mechanisms that cause deterioration of concrete.

**Section 3. Geophysics (30 minutes).**

**Answer ALL of the following.**

- (a) Define the resistivity of a material and explain the difference between apparent resistivity and bulk resistivity in the context of the electrical resistivity technique.
- (b) Give an equation for the apparent resistivity for Schlumberger arrays. Explain the principles of conducting a Vertical Electrical Sounding (VES) using this array over a layered earth. Illustrate your answer with a graph of an apparent resistivity curve, paying particular attention to the annotation of the axes.
- (c ) Comment on the shape of the apparent resistivity curve if the ground consists of a resistive layer between conductive top and bottom layers.