

National University of Ireland, Galway  
OLLSCOIL NA hÉIREANN, GAILLIMH

CHRISTMAS EXAMINATIONS 1<sup>ST</sup> SEMESTER 2000

**4th SCIENCE  
ENGINEERING GEOLOGY (GE424)**

**PAPER ONE**

Prof. J.F. Dewey  
Prof. Paul D Ryan  
Dr. Kate Moore

**Time allowed: 2 hours.**

**You should aim to spend 40 minutes on each section.**

**Answer each section in a separate booklet.**

**Section 1. Geology.**

**Answer ALL of the following.**

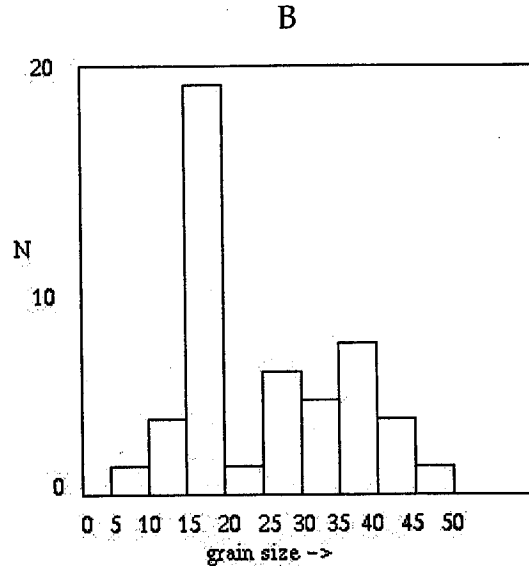
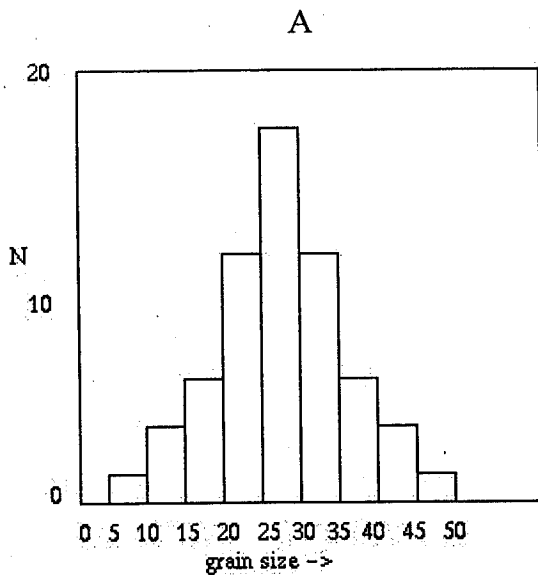
- (a) Describe the principles behind, set-up of, and use of a triaxial testing rig.
- (b) Describe how varying physical conditions affect the strength of a geological material.
- (c) Give three tests for aggregates as road-stone and state what properties of rock they are measuring.
- (d) Why does concrete take time to reach its 'full strength'?
- (e) Three groups of materials that are unacceptable as aggregates in concrete include (i) opal, chalcedony and rock glass (ii) altered silicates and (iii) salts. Explain why this is for each of the groups.
- (f) Why must the content of pulverised fuel ash (PFA) used in mixing concrete be limited?

**Section 2. Statistics.**

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

- 1) Examine the two histograms A) and B) which are measures of clast sizes in a gravel, then answer the following questions:

*contd./*



which of these distributions is approximately 'normal?'	A	B
for which of these samples would the mode be the best measure of central tendency?	A	B
for which of these samples would the quartiles be the best measure of dispersion?	A	B
for which of these samples would the standard deviation be the best measure of dispersion?	A	B

2) Tick which of these factors would make you decide to use a non-parametric test to compare two samples?

Sample size < 10	
Sample size > 100	
samples thought to be drawn from a normally distributed population	
samples drawn from a population whose distribution is unknown	

3) Give geological examples of the following data types:

nominal	
ordinal	
ratio	
time series	

4) If you have the following data measured on two variables from a given rock type what type of correlation coefficient would you calculate and why?

DATA	CORRELATION COEFFICIENT	WHY? WHAT ARE THE ADVANTAGES OF YOUR CHOICE?
Ordinal data such as hardness and relative grain size		
normally distributed ratio type data such as Fe and Mg content		

### **Section 3. Geophysics.**

**Answer all of the following.**

Give the meaning of the terms resistance, resistivity and apparent resistivity, as used in electrical surveying, and explain the differences between them.

Describe how the Vertical Electrical Sounding (VES) method of exploration is carried out and outline the way in which the results can be interpreted in terms of a layered structure.

A VES using the Wenner array gave a resistance value of 40 Ohms when the electrode spacing (a-spacing) was 2m. When the electrode spacing is increased to 4m the resistance fell to 20 Ohms. At an electrode spacing of 8m the resistance value was 10 Ohms. What can you conclude from these readings?