

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

APPLIED PHYSICS DEPARTMENT

**SPH 4103 – RESEARCH METHODOLOGY**

BSC HONOURS PART IV: DECEMBER 2005

DURATION: 3 HOURS

ANSWER **ALL** PARTS OF QUESTION 1 IN SECTION A AND ANY **THREE** QUESTIONS FROM SECTION B. SECTION A CARRIES 40 MARKS AND SECTION B CARRIES 60 MARKS.

**SECTION A**

1. (a) Compare and contrast basic research to applied research. [4]
- (b) Briefly describe four outstanding characteristics of research. [8]
- (c) From the following list of statements, some of which represent steps in the research process, order the steps according to their sequence, leaving out those that are not relevant;
- reviewing literature,
  - teaching teachers how to teach well,
  - writing the research report,
  - constructing experimental designs,
  - constructing hypotheses,
  - identifying a problem,
  - analysing data,
  - constructing operational definitions,
  - identifying and labelling variables,
  - considering individual differences,
  - manipulating and controlling variables,
  - constructing a research design,
  - resolving problems of discipline.
- [5]
- (d) A project is proposed to investigate how people behave under extreme physical discomfort. What specific ethical considerations should researchers take into account? [4]

- (e) Explain how abstracts differ from other summaries. When are abstracts used? [9]
- (f) Discuss the various considerations in selecting a research problem. [10]

### SECTION B

2. Read the abstract provided below and answer the following questions.

Surface geophysical methods are used in groundwater investigations to locate and map subsurface aquifers, using surface measurements of physical properties of the ground. For borehole siting it is essential to first locate potential sites before drilling. Electrical resistivity and conductivity are the physical properties widely used for groundwater surveying. In this study the very low frequency (VLF) electromagnetic method was used in conjunction with the electrical resistivity method to investigate the lateral variations in the ground resistivity. The investigations were intended to find out if the VLF method could replace the Schlumberger electrical resistivity method for locating potential sites for vertical electric sounding. The results showed that the two methods located the same sites along the marked profile lines, with the VLF method cheaper and easier to handle. The vertical electric sounding (VES) results were used for ground modelling using the method of curve matching. The obtained models were then used to estimate the thicknesses and the resistivity of the layered Earth at the potential sites. Ultimately, it was shown that use of the VLF enhances the quality of the results in such kind of surveys.

- (a) Give a likely title to the study described in this abstract and provide a statement of the problem. List at least two sub – problems. [6]
- (b) In your opinion is this a 'good' abstract? What do you consider to be qualities of a good abstract? [6]
- (c) Discuss this abstract in relation to its internal and external validity. [8]
3. (a) What personal knowledge would you need before getting into the library to gather data or review literature [2]
- (b) There is a great stress on references in literature review. Why is this so important? [4]
- (c) Summarise why you think the section on review of literature is an essential part of the project. [8]
- (d) Show what dangers would arise if this section were removed from the project. [6]
4. (a) Compare and contrast the descriptive type of research method to the scientific type. [6]
- (b) Give and explain three formats used in questionnaires to solicit relevant information. [6]
- (c) In a descriptive survey, explain with examples what you understand by:  
(i) the nature of the population,  
(ii) the type of investigation,  
(iii) the degree of precision desired. [8]
5. Describe sampling procedures making sure you discuss the following topics:  
(i) construction of samples,  
(ii) selection of representative samples,  
(iii) obtaining an adequate sample,  
(iv) random sampling,  
(vi) stratified sampling. [20]

6. (a) (i) What are the main characteristics of a research proposal? [6]  
(ii) State clearly what information is expected in the introduction section of the proposal. [4]
- (b) (i) By considering the Introduction and Method sections, clearly show the differences between a research proposal and the research report. [6]  
(ii) Give two standard methods that are used in referencing of articles in research reports. [4]

- END OF EXAM -