NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

APPLIED PHYSICS DEPARTMENT

MAPH 6123 - RESERVOIR GEOPHYSICS

MSc GEOPHYSICS PART I: MAY 2005 *DURATION: 4 HOURS*

Answer all questions in this paper. The maximum possible marks is 100%.

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1. Building a dam in an area of known seismic activity need not, of itself, be dangerous. The extent of seismicity, in most cases, is little known. Using the Lake Kariba dam in Zambia / Zimbabwe, describe the reservoir induced seismicity (RIS) that occurred and the consequences (if any at all). [12]

2. What are "inclusion counts" in porosity ? Of what use are the inclusions in materials? [6]

3. For geophysicists, well logs form the basis for relating seismic properties to the reservoir. In all cases, the log data requires editing, normalization and some interpretation, before it can be used in reservoir studies. Write down six specific analysis steps that must be followed before use is made of the data. [15]

4. Describe in detail, the Bell and Nur (1978) relation for pore-pressure response to reservoir impoundment. [10]

5. In the management of dams, what is meant by "managed flood" ? [4]
Itemize the steps that make a set of guide lines for managed flood releases as agreed upon at the March 2001 Lusaka, Zambia Workshop on Dams. [8]

6. The temporal effect of water impoundment on a dam may be divided into two parts. Describe in detail, the two parts and give specific reference to elastic response, undrained response, drained response, pore-pressure diffusion and coupled response. (*Where possible, illustrate with equations and diagrams for clarity of your answer*). [15]

7. Nyamandhlovu area houses an aquifer beneath it. Explain the type of geology expected in the area that makes it a good aquifer. Earthquakes that occur in the area are known to be associated with pore-pressure and water abstraction. Explain the mechanism responsible for the occurrence of the earthquakes. Why the earthquakes do not occur soon after the recharge or heavy abstraction of water from the aquifer ? [15]

8. The World Commission on Dams (WCD) was launched in the year 2000. Their report highlighted findings in the following three key areas:

i) financial and economic performance [5]

ii) ecosystem and large dams [5]

iii) people and large dams. [5]

Summarize the findings in all the three categories.

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