RHODES UNIVERSITY
DEPARTMENT OF ENVIRONMENTAL SCIENCE

EXAMINATION: JUNE 2014

ENVIRONMENTAL SCIENCE HONOURS

ENVIRONMENTAL MODELLING

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Internal examiners: Prof J Gambiza   MARKS: 100

External examiner: Dr P. O'Farrell   DURATION: 3 HOURS

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GENERAL INSTRUCTIONS TO CANDIDATES

1. Answer **EVERY** section, noting the choice within sections.
2. Answer each section in a **SEPARATE** answer book.
3. Time management is very important. The value of the mark for each question should be used as a rough guide to the amount of time allocated to answer the question.
4. It is in the candidate's interest to write legibly.
5. At the end of the examination, place all answer books inside the book used to answer **SECTION A**.

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PLEASE DO NOT TURN OVER THIS PAGE UNTIL TOLD TO DO SO.

SECTION A: (30 marks)

Please answer any THREE questions

Question A1:   **10 marks**

What are the major limitations of population projection matrix models?

Question A2:   **10 marks**

Use clearly labelled diagrams to explain any two commonly used generic templates in system dynamics modelling.

Question A3:   **10 marks**

Justify the need for environmental modelling.

Question A4:   **10 marks**

What are stocks and flows? Use examples from environmental science to describe their characteristics.

SECTION B: (40 marks)

Please answer TWO questions

Question B1:   **20 marks**

Discuss the key issues in the construction and use of mental models in environmental management.

Question B2:   **20 marks**

Explain the characteristics of a good system dynamics model.

Question B3:   **20 marks**

Discuss the commonly observed time paths in system dynamics.

SECTION C: (30 marks)
Compulsory Question

Question C1   **30 marks**

A reverend in a rural area gave his neighbour, who was a local farmer, ten cows to look after because he was going overseas for 20 years. On his return, he comes to you for advice on how many cattle he should expect to receive from his neighbour. Use system dynamics modelling to determine the number of animals the reverend should expect to receive. Use a clearly labelled system dynamics diagram to illustrate your answer. State the key assumptions you made.

END OF EXAMINATION PAPER