

UNIVERSITY OF SOUTH AUSTRALIA

DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING AND THE
ENVIRONMENT

School of Geoinformatics, Planning and Building

Semester 2, 2000

Earth Observation Science 1 (10215)

Time Allowed : 3 hours + 10 minutes reading time

General Instructions to Candidates

Attempt all questions.

Marks for each question are shown [## marks (%)]. Total marks for the examination is 100%.

This is an open book examination.

Programmable calculators are permissible.

Please ensure front of answer books are completed with your name, student I.D. number, course and section of the examination.

Question 1 [25 marks (%)]

Land cover mapping using satellite imagery can be achieved using a variety of image processing techniques. Describe in detail, and in your own words, the methods used in multi-spectral classification and multi-temporal classification, using both visual (key) interpretation and computer classification. Include a detailed discussion on the strengths and weaknesses of each method.

Question 2 [10 marks (%)]

Which parts of the electromagnetic spectrum would be suitable for environmental monitoring from space. In your own words, describe in detail two examples illustrating types of environmental monitoring.

Question 3 [15 marks (%)]

Examine the satellite image of *Cooper Creek, Queensland* and answer the following:

- (a) State the band combination used and explain why the flood waters appear cyan (combination of blue and green) and the vegetation red.
- (b) Are the flood waters rising, at their peak, or falling? Give reasons, based on the image, for your answer.
- (c) The mosaic was made from SPOT 4 Xi images. State the ground pixel size, band spectral wavelengths and radiometric resolution of the SPOT 4 Xi sensor and the SPOT 1-3 XS sensor.
- (d) Describe a method for mapping the extents of flood waters as the flood peak moves downstream across several image scenes.

Question 4 [20 marks (%)]

In the formation of a stereo-model in analytical photogrammetry the procedures of interior orientation (IO) and exterior orientation (EO) (either in separate steps of relative orientation (RO) and absolute orientation (AO) or simultaneously in a single step method) are generally performed.

For each procedure give a description of

- the aim of the procedure;
- the procedure itself (including the number, position and nature of points that you would observe to); and
- the expected or acceptable accuracy obtainable in the procedure.

Question 5 [20 marks (%)]

Consider that a small "block" of overlapping aerial photography of scale 1:10,000 over an urban region is to be processed into a seamless ortho-photo image database. The photography can be considered to be quite standard (*typical* might be a better word) and has been captured with a survey camera using a wide angle lens. A digital terrain model is available for the region although it is not of particularly high accuracy in that it contains errors of approximately ± 5 metres apart from the usual blunders and inconsistencies that normally exist.

List and discuss the procedures required to complete the project (including alternatives) giving full consideration to issues relating to the geometric accuracy of the final product.

Question 6 [10 marks (%)]

Imagery obtained from satellite borne scanners is generally "geo-coded" by way of parametric and/or polynomial rectification. Briefly discuss the process in general being sure to include comments on the mathematical model(s) and the control requirements.