# UNIVERSITY OF KWAZULU-NATAL
## SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
## DISCIPLINE OF GEOGRAPHY
## EXAMINATION: MAY/ JUNE 2014
## ANALYTICAL GIS AND ADVANCED SPATIAL MODELLING, ENVS 712

**DURATION: 3 HOURS**                    **TOTAL MARKS: 300**

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**External Examiner: Prof. S. Grab**

### NOTE: THIS PAPER CONSISTS OF 2 PAGES

Answer a total of **THREE** questions, at least **ONE** from **EACH** section. Each question carries 100 marks.

**Section A**

**1.** You are provided with the following raster maps.

| A. | |
|---|---|
| Agric | Mining |
| Mining | Agric |

| B. | |
|---|---|
| 500 m | 400 m |
| 300 m | 700 m |

**a.** Using the two maps, shade the cells provided below that meet the following conditions *(Draw the cells as illustrated below in your answer script)*:

(i)    (B ≤ 500 m)
(ii)   (A = "Agric") AND (B < 500 m)
(iii)  (A = "Agric") OR (B < 700 m)
(iv)   (A = "Mining" XOR (B < 700 m)
(v)    (A= "Mining" AND NOT (B < 400 m)

[20]

(i)                (ii)               (iii)              (iv)

| | |
|---|---|
| | |

| | |
|---|---|
| | |

| | |
|---|---|
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| | |
|---|---|
| | |

(v)

| | |
|---|---|
| | |

**b.** Geographic analysis is what makes GIS more than just an electronic atlas or map production system. Discuss in detail the neighbourhood and overlay operations as forms of geographic (spatial) analysis. [80]

2. Study the confusion Matrix table below and answer the questions that follow.

| Class | Forest | Agriculture | Water | Soil | Urban |
|---|---|---|---|---|---|
| Forest | 10 | 1 | 0 | 0 | 0 |
| Agriculture | 1 | 11 | 1 | 0 | 1 |
| Water | 0 | 3 | 18 | 2 | 0 |
| Soil | 1 | 0 | 0 | 4 | 1 |
| Urban | 0 | 1 | 0 | 2 | 6 |

(i) Using the confusion matrix presented in the table, calculate the overall accuracy, errors of commission and errors of omission for each class. [20]

(ii) Using examples from classes in the table, explain in detail the difference between the producer accuracy and user accuracy. [20]

(iii) With reference to any two stages of the GIS data processing cycle, discuss the sources and methods of detecting error. Analyse the measures that may be taken to minimise such errors. [60]

**Section B**

3. Landslides and floods are examples of natural disasters that can cause severe damage, loss or destruction to the socio-economic system. Using real world examples, critically examine the application of GIS in the disaster management cycle (prevention, preparedness, relief, rehabilitation and reconstruction) of landslides and floods. [100]

4. With reference to examples, evaluate the utility of GIS in integrating local participatory processes and regional levels of land use planning. [100]
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5. Using any process driven models (hydrological or climatic or ecological) of your choice, evaluate the use of GIS in the development and extrapolation of such models in both space and time. [100]

6. Analyse the role of GIS in modelling and explaining vegetation distribution patterns in both space and time. [100]

**END**