UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
THEORY EXAMINATION: JUNE 2013
MODULE NAME & CODE: ANALYTICAL GIS AND ADVANCED SPATIAL MODELLING, ENVS712

DURATION: 3 HOURS **TOTAL MARKS: 200**

INTERNAL EXAMINER: **DR M GEBRESLASIE**
EXTERNAL EXAMINER: **PROF S GRAB**

INSTRUCTIONS: **THIS PAPER CONSISTS OF THREE PAGES.**

Answer question 1 of section A, any two questions from section B and any two questions from section C

SECTION A: (Question ONE is compulsory)

1. You are provided with the following raster maps.

A.

P	P	P	E	E	A
P	P	E	E	E	A
E	E	P	P	A	A
E	E	P	P	A	A
P	P	A	A	E	E
P	P	A	A	E	E

B.

5	5	4	4	4	6
5	5	4	4	4	6
5	5	6	6	6	6
4	4	6	6	7	7
4	4	4	4	7	7
4	4	4	4	7	7

A = *Acacia* tree

E = *Eucalyptus* tree

P = *Pinus* tree

4 = Four year old

5 = Five year old

6 = Six year old

7 = Seven year old

a. Using the two maps, draw and shade the cells that meet the following conditions:

(i) (B ≥ 5 year old tree)

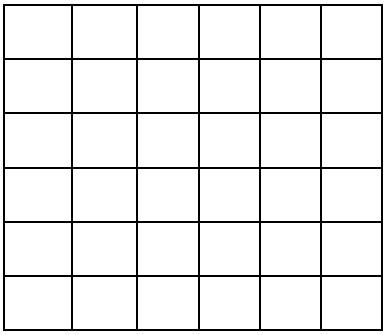
(ii) (A = "*Acacia*") AND (B <5 year old)

(iii) (A = "*Eucalyptus*") OR (B <6 years old)

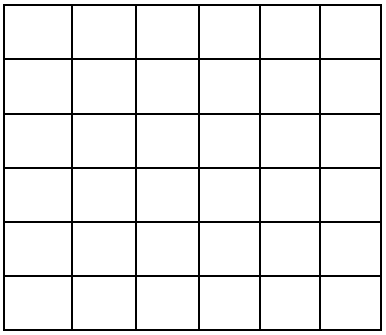
(iv) (A = "*Eucalyptus*") XOR (B <5 years old)

(v) (A = "*Pinus*") AND NOT (B <5 years old) **[50]**

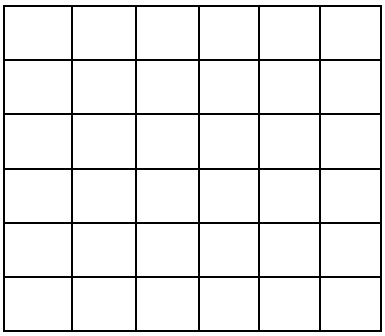
i)



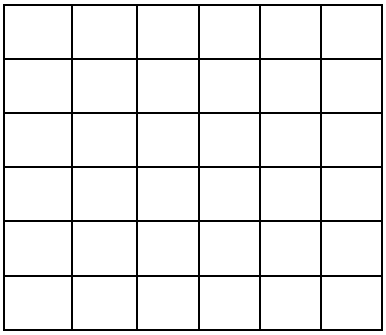
ii)



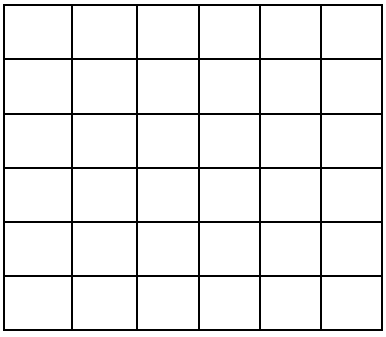
iii)



iv)



v)



SECTION B: (Answer Two Questions)

1. With reference to a specific application, provide steps for inductive modeling in spatial science. **[25]**
2. Kriging is regarded by many scientists as the optimal method of spatial interpolation. Outline and explain the main features of kriging and discuss its strengths and weaknesses relative to other local interpolation techniques. **[25]**
3. GIS data from different sources can present problems during integration and analysis. Discuss the different sources of GIS data, the possible difficulties during integration and how they can be resolved. **[25]**

SECTION C: (Answer One Questions)

1. Using real world examples, critically examine the utility of GIS in quantifying the frequency, character and magnitude of hazardous events in an area, as a means to mitigate natural disasters. **[100]**
2. The Malaria disease distribution pattern can be achieved by integrating environmental factors in a spatially explicit context. Discuss the role of spatial analysis in modeling and explaining the temporal and spatial malaria transmission pattern. **[100]**
3. In your own words briefly explain how regression analysis is used to develop a prediction equation from a “map stack” of geo-referenced mapped data (continuous surfaces). Be sure your answer discusses how the data is re-organized from geographic space into data space for fitting the regression line. Also, comment on the data types required for regression. **[100]**