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Department of Geography, Geoinformatics
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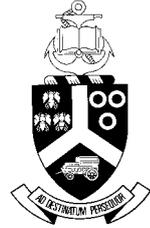
GIS 310
Eksamen / **Examination**
GIS

*Interne Eksaminato*r/**Internal Examiner**
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*Eksterne Eksaminator/***External Examiner**
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TYD / TIME: 180 MIN	DATUM / DATE: 9 *JUNIE/*JUNE 2005	PUNTE / MARKS 159

INSTRUKSIES / INLIGTING
INSTRUCTIONS / INFORMATION

Answer all the questions.

Beantwoord al die vrae.

Multiple-choice questions: [20]

1.   Latitude/Longitude coordinate conversion forms a major part of GIS data input. When converting latitude and longitude into the Cartesian coordinate system.

        a)   Latitude becomes the y coordinate
        b)   Latitude becomes the x coordinate
        c)   Latitude becomes the z coordinate

2.   _____ information should provide the data user with details of the data source, method of data capture, data model, stages of data transformation, editing and manipulation as well as known errors in the data

        a)   Lineage
        b)   Metadata
        c)   Contingency
        d)   Documented

3. Which statement/s is true?

    I.   Small scale maps (e.g. 1:1000 000) = large area BUT no detail
    II.   Large scale maps (e.g. 1:25 000) = smaller area BUT greater detail
    III.   Small scale maps (e.g. 1:25 000) = large area BUT no detail
    IV.   Large scale maps (e.g. 1:1000 000) = large area BUT greater detail
    V.   Small scale maps (e.g. 1:000 000) = smaller area BUT no detail

    a)   I
    b)   I and II
    c)   V
    d)   II and IV
    e)   III and IV
    f)   None of the above combinations
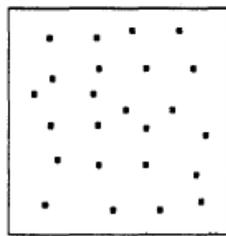
4.   The above diagram is an example of a _____ cover of data observations

    a)   Patchy
    b)   Random
    c)   Stratified
    d)   Clustered

5.   In the Inverse Distance Weighted (IDW) interpolation technique the samples closer to the unsampled location have less influence in the estimate than samples farther away.

    a)   True
    b)   False
    c)   Depends on the weight of the known samples

6.   Which of the following is NOT one of the 5 types of data retrieval functions suggested by Dangermond (1983):

    a)   Multiple map sheet query
    b)   Cursor inquiry mode
    c)   Boolean attribute retrieval
    d)   Query generation window
    e)   Windowing

7.   Trend surface analysis is an example of a _____ interpolator

a) Stochastic, global, gradual
b) Deterministic, global, gradual
c) Stochastic, local, abrupt
d) Deterministic, local, gradual
e) Difficult

8. In the world of GIS, another term for the property of connectivity is:

a) Proximity
b) Neighbourhood
c) Topology
d) Boolean identity
e) Location

9. Which of the following are true?

I. Digitising is defined as converting aerial photographs into maps
II. Digitising involves tracing map features into a computer
III. A keyboard cannot be used to digitise maps, only to enter attribute information
IV. Digitising from a tablet involves using a template
V. A digitising tablet and mouse are examples of input devices used in digitising

a) I
b) II and IV
c) II and V
d) II, IV and V
e) They are all true
f) None of the above combinations are true (i.e. options a - e)

10. Layers or levels in a GIS can be used to:

I. Group related geographic features by function
II. Isolate point, line, and area features
III. Develop thematic maps
IV. Combine non-spatial and attribute information
V. Highlight logical relationships among geographic features

a) I
b) II and V
c) I, II and V
d) I, II, III and V
e) They are all true
f) None of the above combinations are true (i.e. options a - e)

<u>True or False</u>   [10]

1. The flat file model consists of tables of attributes for values (columns) and records (rows)

2. An advantage of raster data storage is the smaller amount of data to be stored

3. Inverse Distance Weighted is an example of a global, deterministic, exact interpolator

4. If you need maps that are accurate (in 90% of their locations) to within 30 metres, you would not use anything produced at a scale smaller than 1:5,000.

5. Suppose that when you overlay two data layers, each produced at a scale of 1:250,000, you notice points on one of them are systematically displaced 11 meters northwest of corresponding points on the other. This does not mean anything is wrong, since the accuracy of data produced at this scale is expected to be much worse than 11 meters.

<u>Short questions</u>   [26]

1. What is the difference between interpolation and extrapolation?   (4)

2. Explain a strategy for determining if a point lies within or without a polygon. Use a sketch along with your explanation.   (4)

3. What is geocoding?   (4)

4. Explain the fundamental differences between a DEM and a TIN.   (4)

5. Explain the difference between attribute and spatial data, give examples.   (4)

6. Calculate the value of cell H7 if a 3x3 kernel is applied using the following standard filters: (4)

	1	2	3	4	5	6	7	8	9	10
A	2	3	2	5	9	1	6	4	2	5
B	5	4	5	6	2	3	2	1	2	2
C	2	2	3	3	5	4	2	6	2	4
D	5	5	5	4	4	4	5	3	5	4
E	6	6	5	5	4	5	4	4	4	5
F	4	4	5	5	4	3	3	5	3	2
G	2	3	4	2	3	3	3	2	3	5
H	4	4	5	2	5	6	3	2	2	1
I	3	3	5	3	5	1	5	5	5	1
J	4	4	4	4	4	2	5	5	6	2

A) Min filter
B) Modal filter
C) Diversity filter
D) Max

7. What are the most basic elements of a network? (2)

___

Long questions: [53]

1. Describe the line threading interpolator by answering the following questions:

   a) Definition
   b) Type of interpolator
   c) The process of line threading
   d) Limitations
   e) Diagrammatic example (15)

2. Calculate the area of the quadtree polygon (A) below (10)
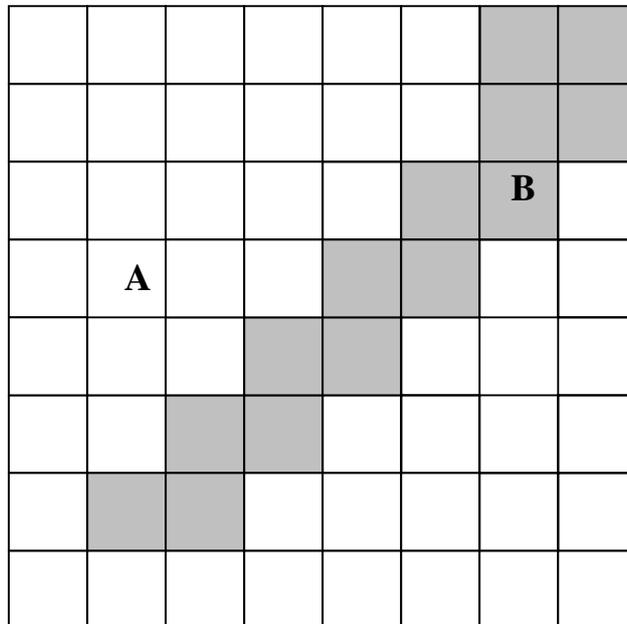
NOTE: *Dimension of pixel = 1km* 1km*

HINT: Structure your answer according to the following table.

Leaf	Level	Area Weight

3. Describe each route optimisation algorithm and suggest two plausible applications for each of the following:

   i)   Shortest path
   ii) Travelling salesman
   iii) Route tracing (12)

4. What is the difference between the modifiable aerial unit problem and ecological fallacy? (8)

5. Name and briefly describe the four methods used for checking data error in GIS. (8)

Essay [50]

The Tshwane Metropolitan Municipality requires a risk assessment of areas likely to be affected if the Vaal River flood plain becomes inundated after heavy rains. Aspects of concern include the cost of flood damage and evacuation routes. As a consultant, you need to construct a database and undertake spatial analysis to solve this problem.

i.   What datasets might you need to undertake such a study?

ii.   How would you find out if the datasets already exist?

iii   What attributes of the datasets would you scrutinise?

iv.   How would you employ these datasets in analysis? Describe, conceptually, the sequence of analytical steps you might take to assess the potential cost of flooding damage

Similarly, describe how you might assess accessibility of the population to the transport network for evacuation purposes.

TOTAL: 159 marks