VIU VANCOUVER ISLAND UNIVERSITY

Vancouver Island University
Advanced Diploma in GIS Applications

Geography 521
General Spatial Analysis
Final Exam

Time: 3 hours
Total: 100 marks

Instructions:

1. Questions are saved automatically as they are answered.
2. Do not press the "Submit All and Finish" button until you have checked your answers and are completely finished. You only get one attempt on this exam.
3. The clock will continue to tick even if you log off.
4. This is an open book exam.
5. Please contact me by Skype or e-mail if you have any technical difficulties.

Good Luck!

Part 1: Multiple Choice Questions (48 marks)

Question 1 (1 point)

If I had a shapefile containing roads, and wished to find all houses within 200m of every road in the file, the first operation that I would perform is:

○ Intersection
○ Select by Attribute
○ Union
○ Buffer

Question 2 (1 point)

Under which of these conditions would you definitely favour vector analysis over raster analysis?

○ When you are trying to get an overall view of the data
○ When the results are required rapidly
○ When the precision of the result is important
○ When the input data is very accurate

Question 3 (1 point)

The distance from A to B "as the crow flies" is an example of:

○ Mahanobis Distance
○ Manhattan Distance
○ Migratory Distance
○ Euclidean Distance

Question 4 (1 point)

What does the corridor function create?

○ A raster path from A to B, following the line of lowest elevation
○ A polygon area between A and B within which all water flows into the centre
○ A surface showing the cost of travelling between A and B at every point
○ A raster path from A to B along the shortest Euclidean distance
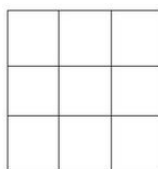
Question 5 (1 point)

An example of ratio data is:

○ Room temperature, classified into Hot, Warm, Cool, and Cold
○ Dates in the Christian Calendar (e.g. 1969 AD)
○ Temperature, measured in degrees Fahrenheit
○ Temperature, measured in degrees Kelvin

Part 2: Short Answer Questions (28 Marks)

Question 49 (2 points)

Given the raster on the left, show what ArcMap would create for the raster on the right, if the resolution of the raster was decreased by 3 times, and Nearest Neighbour Resampling was used.

Format your answer as 3 rows and 3 columns, i.e.
123
456
789

Question 50 (1 point)

How does an Image Raster differ from a Continuous Raster?

Question 51 (2 points)

Perform the following Map Algebra Operation (assume grids overlap exactly and all cells are of equal size)

C/B+A

Raster A   Raster B   Raster C   Answer

Format your answer as 5 rows of 5 columns, for example:

12345
67890
12345
67890
12345

Question 52 (1 point)

What is the Edge Effect?

Question 53 (1 point)

What is the directional mean of 320° and 10°?

Part 3: Long Answer Questions (24 marks)

In this section, you will be asked to propose a solution to the problems described. Try to describe the data layers used, the geoprocessing steps performed, and the form and appearance of the output products. Numbered steps in point form is perfectly acceptable (even desired). I am interested in your ability to describe the process, not the actual buttons to press, so if you can remember the names of specific commands that's wonderful, but if you cannot, try to describe the function to be performed in generic terms, or describe what the function does.

Question 63. Choose Either Scenario A _or_ Scenario B and answer in the space provided. Answer only one. (8 marks)

Question 63 (8 points)

__Scenario A__

Congratulations, you have just graduated from the ADGISA program and have landed a job at the BC Centre for Disease Control.

About a month ago, unbeknownst to you, an influenza pandemic erupted in Southeast Asia. Now that you think about it, you didn't study very hard for the interview, and they seemed very eager to hire....

Unlike SARS and H1N1, however, this strain has a long incubation period, the right characteristics to spread rapidly, and high lethality, but not so high as to "burn itself out." Because of the long incubation period, a number of infected people returned from vacations in the region undetected, and only in the last few days have some of them begun to report symptoms of this flu.

You are given:
1. A well-equippped GIS Lab in a clean room with enough food and water to last you 120 days (complete with a cot, washroom, and all of Michael Crichton's novels for reading material, not that you will have time for any of these.)
2. Daily reports showing the locations of all individual reported cases, delivered as a .CSV file.
3. Statistics which describe the rate of spread under different population densities (on paper).
4. The latest Census data for British Columbia showing the populations of each Census Tract (CT) delivered as a series of shape files.

Your Task:
1. Provide daily maps showing the extent of the outbreaks
2. Produce maps showing predictions for the areas that are likely to be affected next
3. Provide estimates of the number of people currently affected in the province.
4. Determine the location of "hotspots" of infection.

Question 64 (8 points)

__Scenario B:__

School District 68 has contracted your firm to locate a new secondary school that will amalgamate Nanaimo District Secondary School and Woodlands Secondary School. The new school, which will serve over 2000 students, has been controversial because of the additional distance that students will have to travel. However, the School District Superintendent thinks that if an ideal site is found, where travel distances for all students are minimized, that she can win enough public approval to build the new school.

You Have:
1. The addresses of all students who currently attend the two schools
2. A detailed road map of Nanaimo, which has information on address ranges for each block
3. A map from the City of Nanaimo that gives legal descriptions for all lots in the city
4. A list of available properties from the School District's realtor, showing the price and legal description
5. A detailed DEM of Nanaimo

Your Task:
Find an appropriate lot for the new school where travel distances for all students are minimized. In addition to location, other factors to consider are:
1. The cost of the lot (maximum $7 million)
2. The size of the lot (minimum 2.5 Ha)
3. The local topography (sports fields must be built, so a slope of < 10% is required), and
4. The proximity to major roads (< 100m) to allow sufficient vehicle access

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END

Congratulations. Geog 521 is finished!

If you haven't submitted Lab 6 and the Learning ArcGIS Spatial Analyst certificate, please get these in by Oct 28 at midnight.

Geog 530, *Programming Foundations* with Dave Cake and Geog 523, *Advanced Applied Spatial Analysis* with yours truly begin Monday.

You have been a great class -- it's been a blast working with you!

- Brad.