Name:_____

CE 394K.3 GIS in Water Resources   Midterm Quiz   Fall 1999

There are 5 questions on this exam. Please do all 5. They are of equal credit.

1. (a) Assuming the earth's radius is 6370km, at 30ºN, what is the distance on the earth's surface of:

1º of longitude

1º of latitude

   (b) Briefly explain, using a diagram, why a hurricane rotates counterclockwise on the earth's surface in the North hemisphere.

   (c) Briefly explain, using a diagram, the idea of transform coefficients which define the connection between the characterization of land and the water systems. Give an example of such a coefficient which you have used in this class.

2. A digital elevation model (elevations in meters) and an annual rainfall (P) grid (mm/yr) are shown below.

(a) If the annual runoff (R) is given by the function R = 0.51P – 336, determine the annual runoff grid (mm/yr).

(b) If the cell size is 1 km, find the accumulated mean annual flow (m³/yr) in the central cell in the grid, and at the outlet cell. At each of these cells, include the flow deriving from the cell itself in your calculation.

(i) Digital Elevation Model

44	37	38
31	22	24
21	16	19

(ii) Annual Rainfall

900	980	1240
860	930	970
830	880	930

(iii) Annual Runoff

3. (a) Define, using diagrams, the terms

Latitude

Longitude

(b) The following is the specification of a map projection. Beside each line of this description, label what that term represents. What coordinate system does this map projection define?

projection albers
units meters
datum NAD83
spheroid GRS1980
parameters
27 25 00
34 55 00
-100 00 00
31 10 00
1000000.0
1000000.0

(c) Define the terms, ellipsoid and geoid. Draw a diagram showing the ellipsoid, geoid and land surface of the earth, and show on the diagram how elevation is measured.

Ellipsoid

Geoid

4. (a) The new GeoDatabase model of ArcInfo 8 introduces several new terms for GIS data description. Define the following terms

Class

Object

Property

Behavior

(b) A drainage basin is made up of n watersheds, and has a property of drainage area. Each watershed has properties of drainage area, slope and annual precipitation. Assuming that the basin object is derived from a polygon object, draw an object model diagram to illustrate the connection between polygons, basins and watersheds.

(c) Define the term "complex edge" using a diagram. Briefly explain how the Mississippi River could be represented as a complex edge.

5. (a) The following table was derived from soil map unit TX541 in the Guadalupe Basin. Find the % of the soils in hydrologic soil groups A, B, C, D, and the average land surface slope of the soils in this map unit.

Muid	Seqnum	Compname	Comppct	Slopel	Slopeh	Hydgrp
TX541	1	STRABER	37	0	3	C
TX541	2	CROCKETT	2	0	1	D
TX541	3	CROCKETT	9	1	3	D
TX541	4	CROCKETT	7	2	5	D
TX541	5	ROSANKY	10	1	3	C
TX541	6	ROSANKY	6	3	5	C
TX541	7	ALUM	7	1	3	B
TX541	8	ALUM	3	3	5	B
TX541	9	NOCKEN	9	1	8	C
TX541	10	ROCK OUTCROP	1	1	8	D
TX541	11	ZAVALA	2	0	1	B
TX541	12	ZAVALA	4	0	1	B
TX541	13	LEMING	3	0	3	C

(b) You are given the task of calculating the nonpoint source pollution load from bacteria in a drainage area. Specify the GIS data layers you would need to accomplish this task and briefly outline the computational procedure you would use.