Name:_____

GIS in Water Resources Midterm Quiz Fall 2004

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

1. In exercises in this class you have developed the skills to build a basemap of information about watersheds. You have been asked to prepare a GIS basemap of a watershed from nationally available data sources. Your map should contain

- Elevation
- Slope
- Catchments
- Stream network
- Stream gages
- Precipitation gages

a) Some of these data are available from national data sources, while others you would need to derive from GIS processing. For each dataset above indicate how or where it would be obtained or derived.

Elevation

Slope

Catchments

Stream network

Stream gages

Precipitation gages

b) Indicate the GIS format (grid, point, line, polygon etc) used to represent each dataset.

Elevation **Slope**

Catchments **Stream network**

Stream gages **Precipitation gages**

2. Logan, Utah is located at 41°44'N, 111°50'W.
Austin, Texas is located at 30°11'N, 97°40'W.

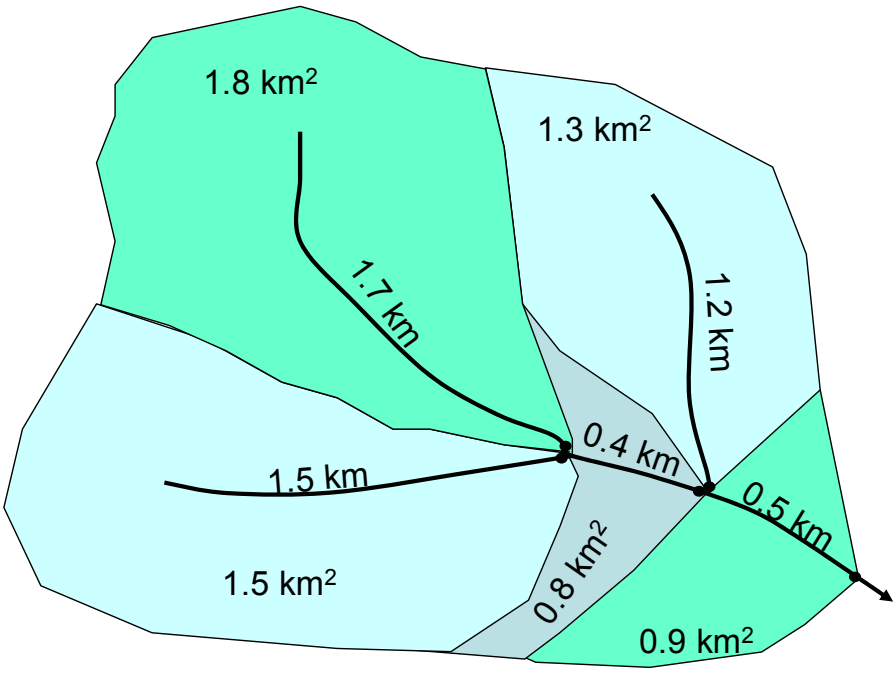
a) Convert these coordinates to decimal degrees and indicate which of these numbers represents longitude and which represents latitude by filling the corresponding decimal degree longitude and latitude into the following table

	Longitude	**Latitude**
Logan		
Austin		

b) Assume a spherical earth with radius of 3958 miles. Calculate the North-South distance from Logan to Austin.

(c) Suppose you have a rectangular box with Logan at the top left corner and Austin at the lower right corner. Calculate the surface area of the earth (square miles) contained within this box. State any assumptions or approximations.

3. The figure below depicts the channel networks, catchments and junctions within a river basin.



a) Assign a consistent set of Shape Length, Shape Area, HydroID, DrainID, NextDownID values in the following attribute tables to define the connectivity of this network as used in ArcHydro. Label the Catchments, Drainage Lines and Drainage Points with their HydroID's in the drawing.

Attributes of Drainage Line

Shape	Shape Length	HydroID	NextDownID	DrainID
Polyline				
Polyline				
Polyline				
Polyline				
Polyline				

Attributes of Drainage Point

Shape	HydroID	DrainID
Point		
Point		
Point		
Point		
Point		

Attributes of Catchment

Shape	Shape Area	HydroID	NextDownID
Polygon			
Polygon			
Polygon			
Polygon			
Polygon			

b) Evaluate the drainage density of this channel network.

4. Following are screen captures from the attribute tables of "Monitoring Points" and "Time Series" from Exercise 4.

Attributes of MonitoringPoint

OBJECTID	Shape*	HydroID	HydroCode	FType	Name	JunctionID
37	Point	1000042	417787	2	ROUND MOU	<Null>
38	Point	1000043	417983	2	SAN MARCO	<Null>
39	Point	1000044	418187	2	SEGUIN 1	<Null>
40	Point	1000045	418358	2	SISTERDAL	<Null>
41	Point	1000046	418415	2	SMITHVILL	<Null>
42	Point	1000047	418544	2	SPRING BR	<Null>
43	Point	1000048	418877	2	TEAGUE RA	<Null>
44	Point	1000049	419815	2	WIMBERLEY	<Null>
45	Point	1000001	08171000	1	Blanco River At Wimberley Tx	2
46	Point	1000002	08171300	1	Blanco River Nr Kyle Tx	4
47	Point	1000003	08172400	1	Plum Creek At Lockhart Tx	3
48	Point	1000004	08170500	1	San Marcos R At San Marcos Tx	1
49	Point	1000005	08172000	1	San Marcos River At Luling Tx	5

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Attributes of TimeSeries

OBJECTID*	FeatureID*	TSTypeID*	TSDateTime	TSValue
48	1000003	1	6/14/2000	19
49	1000003	1	6/15/2000	14
50	1000003	1	6/16/2000	11
51	1000003	1	6/17/2000	8.8
52	1000004	1	6/1/2000	116
53	1000004	1	6/2/2000	118
54	1000004	1	6/3/2000	116
55	1000004	1	6/4/2000	116
56	1000004	1	6/5/2000	117
57	1000004	1	6/6/2000	119
58	1000008	4	6/1/2000	0
59	1000008	4	6/4/2000	2.02
60	1000008	4	6/5/2000	0
61	1000008	4	6/6/2000	0
62	1000008	4	6/7/2000	0
63	1000008	4	6/8/2000	0
64	1000008	4	6/9/2000	0
65	1000008	4	6/10/2000	0
66	1000008	4	6/11/2000	0
67	1000008	4	6/12/2000	0
68	1000008	4	6/13/2000	0
69	1000008	4	6/14/2000	0
70	1000008	4	6/15/2000	0
71	1000008	4	6/16/2000	0
72	1000008	4	6/17/2000	0
73	1000004	1	6/7/2000	119
74	1000004	1	6/8/2000	119
75	1000004	1	6/9/2000	135
76	1000004	1	6/10/2000	151
77	1000004	1	6/11/2000	193
78	1000004	1	6/12/2000	206
79	1000004	1	6/13/2000	204
80	1000004	1	6/14/2000	201
81	1000004	1	6/15/2000	200
82	1000004	1	6/16/2000	198
83	1000004	1	6/17/2000	196
84	1000005	1	6/1/2000	107
85	1000005	1	6/2/2000	105
86	1000005	1	6/3/2000	109

Record: 1 Show: All Selected Records (0 out of 736 Selected.)

a) Indicate which of these attribute tables is a feature class and which is an object class and why?

b) Plot the time series of streamflow in the **San Marcos River at San Marcos** for the period for which data is visible in these tables. The flow values shown are in cubic feet per second.

c) Indicate the maximum flow and date of maximum flow in the **San Marcos River at San Marcos** for this period.

(d) What is the volume of water (ft^3) that flowed past the gage on the San Marcos River at San Marcos between June 1 and June 17, 2000?

5. (a) Given the following grid of elevations, identify any cells that are pits (sinks) in the grid by drawing a circle around the elevation in that cell. Label the pit cells with the elevation they would have once the pits are filled. Focus only on the ungrayed center cells. The grayed edge cells can by definition not be pits because the elevations off the area shown are not known.

Grid cell size 100m

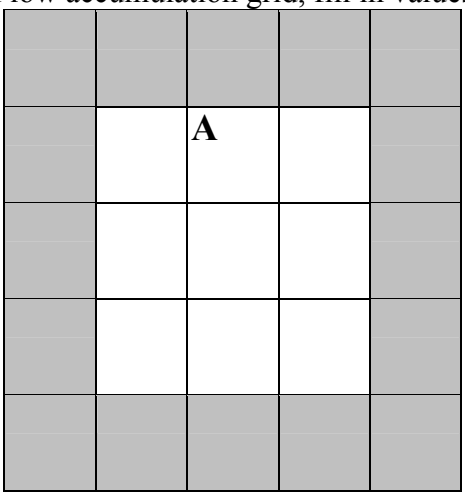
40	43	39	44	40
43	44	A 40	41	40
42	45	38	44	42
43	45	43	43	38
42	42	41	41	40

(b). Determine the **flow direction grid** using the 8-direction pour point method (D8) and pit filled elevations (from part a). Indicate the flow direction by using an arrow in each cell on the grid below. Again do this only for the ungrayed center cells as the flow directions for edge cells can not be unambiguously determined.

Flow direction grid. Indicate values with arrows.

(c). Determine the **flow accumulation grid** corresponding to the D8 flow directions. Label each cell with the number of upstream cells draining **into it** (ESRI convention), again only for the ungrayed center cells.

Flow accumulation grid, fill in values. Grid cell size 100m.



d) Indicate the outline of the watershed draining into grid cell A on the figure above and calculate its area (cell size = 100m).