UNAM

FACULTY	AGRICULTURE, ENGINEERING AND NATURAL SCIENCES		
DEPARTMENT	ENVIRONMENTAL SCIENCE		
SUBJECT	INTRODUCTION TO GIS		
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Supplementary / Special Examination

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This question paper consists of four (4) pages excluding this front page.

Instructions

1. There are three (3) questions (with a total number of 21 sub-questions) and you are expected to answer **all** of them.

2. Write legibly and number your answers clearly.
3. The use of a scientific calculator is allowed.

1.1 State whether each of the following statements is true (T) or false (F):
    a) Features in a vector data structure are represented using grid of cells. (1)
    b) Continuous fields are usually a result of measurements of the variables collected at discrete points and then interpolated. (1)
    c) Interpolation can be defined as a process of predicting values for a surface from a limited number of data points. (1)
    d) During GNNS data collection of measurements, the high the dilution of precision, the better the satellite geometry. (1)
    e) 'Select by Location' query uses topological relationships to describe an association between two layers. (1)

1.2 From your experience working with the GIS standard format data files (shape files), you have observed different extensions associated with a single file (e.g. Roads). Indicate what type of information stored under each of the following extensions:
    a) .dbf (2)

    b) .prj (2)

    c) .shp (2)

1.3 Define the following terms:
    a) Global Interpolation (2)

    b) Map Projection (2)

QUESTION 2 [35]

2.1 How do you understand the term "Adjacency" as a fundamental component of topology?
(2)

2.2 What are the two most important factors in determining the accuracy of the GPS data collection? (2)

2.3 Briefly discuss data 'information' as one component of GIS. (3)

2.4 The scale and resolution of a raster dictates its accuracy. How will the accuracy be affected if one increases the scale of the image? (3)

2.5 There exists three GIS concepts and three attribute concepts that forms the foundation of a GIS. Elaborate on the three basic concepts of attribute tables in a GIS. (3)

2.6 State any two methods of data creation for both vector data and raster data. (4)

2.7 Highlight the differences between orthometric and geoidal heights. (4)

2.8 In most GIS software, e.g. ArcGIS and QGIS, there are various "tools" used to perform different tasks that provide solution to spatial problems, thus aiding decision making. State the function of each of the following tools:
a) Project Tool (2)

b) Buffer Tool (2)

2.9 Arithmetic and Logical operators are the two types of overlay operators. What is the use of each of these type of operators? (4)

2.10 List two types of Map Datums and indicate the role each one plays during measurements. (6)

3.1 Study table 1 below and answer questions that follows.
   a) Draw the geometry of linear features represented in the attribute table to form the indicated left and right polygons. (5)

   b) Label all the geometric primitives (you drew in 3.1 (a)) as represented in the attribute table. (9)

   c) Is there any topological relationship exist between polygon A and B? If 'YES', state which one, and if 'NO', elaborate why not. (3)

Table 1 Attribute table of (vector) linear features

Line ID	Beginning Node	End Node	Left Polygon	Right Polygon
1	I	II	-	A
2	II	III	-	A
3	III	IV	-	A
4	IV	V	-	A
5	V	VI	-	B
6	VI	VII	-	B
7	VII	VIII	-	B
8	VIII	I	-	B
9	I	V	A	B

3.2 Figure 2 below shows some of the different projections from which different regions or countries can choose the type of projection to use for their maps. Provide three factors that influence the choice of projections. (3)
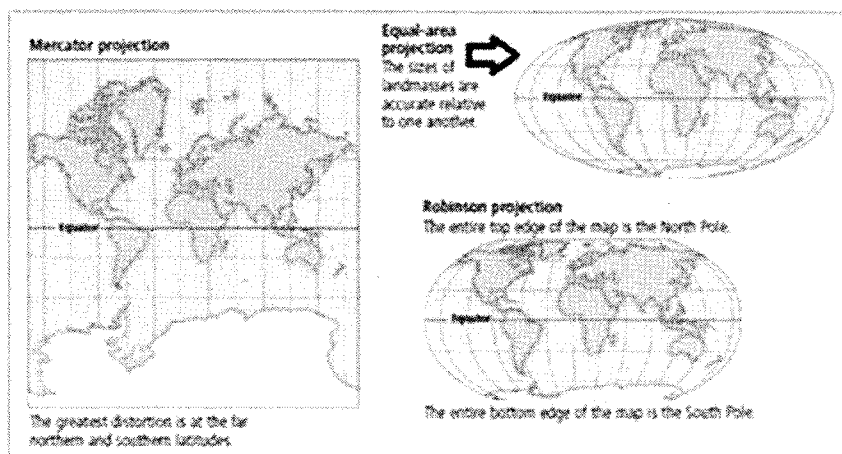

Figure 1 Projections

3.3 In one of your GIS projects, you are tasked to capture geographic features from an orthophotograph (35 cm resolution) and store them in a vector data model. These data will be used for map production among other purposes.

    a) Identify the three geometrical representations that can be used to represent your features in a GIS. (3)

    b) Explain when to represent geographic objects with any one (1) of the geometric representations identified in question (3.3a) above. (3)

    c) It is possible to represent any geographic feature with either of the geometric representations in 3.3 (a). Briefly discuss when this can be possible. (3)

3.4 Give a brief contrast between a 'File Geodatabase' and 'Personal Geodatabase'. (4)

3.5 You are given a ground distance between two points (Point A and Point B) which is 800 m and an Actual Map Scale of 1:25 000. Calculate the map distance in centimetres. (Show your works) (5)

3.6 We can determine the length of any line from the coordinates of the two points that defines the line. Calculate the length of the line defined by the following coordinates (in meters) in a local coordinate system (*Lo. System, with Horizontal Datum = Schwarzeck and Ellipsoid = Bessel 1841*). (Show your steps) (3)

Point	Y	X
A	-7089.62	+63350.30
B	-7120.67	+63413.08

3.7 Calculate the length of a 21° wide line which lies on Latitude 30° 15' 47''S. (3)

3.8 Given the radius (R) of the earth as 6371 km, calculate a great circle distance from Point A, located at: 17°20'39"S, 12°16'31"E to Point B, located at 26°18'32"S, 19°45'35"E. (6)

~~~~~~~~~~~ALL THE BEST~~~~~~~~~~~