USN

Internal Assessment Test 2 – Apr. 2018

Sub:	Geographic Information system				Sub Code:	10CV844	Branch:	CIVIL
Date:	19-04-18	Duration:	90 min's	Max Marks:	50	Sem/Sec:	VIII	OBE

Attempt any 5 questions

		MARKS	CO	RBT
1.	Write a note on GPS. How does GPS work in fixing the location of a place on the earth?	[10]	CO4	L2
2.	Why do you mean by Image processing? Differentiate between: (a) Spatial filtering and contrast enhancement (b) Supervised and unsupervised classification	[10]	CO3	L2
3.	Mentions some parameters of Data Quality. What are the various sources of error in GIS?	[10]	CO5	L2
4.	Explain methods of indexing or partitioning space for spatial data access and search.	[10]	CO1	L3
5.	Mention types of vector spatial data analysis. Explain Overlay analysis. .	[10]	CO2	L3
6.	Write a note on any open-source GIS software. Explain the terms 'open-source', 'copyleft', 'GPL', 'GDAL', 'OGC', 'Plugin'.	[10]	CO1	L2

Solution:

1. The Global Positioning System (GPS) is a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services. This system consists of three segments: the space segment, the control segment, and the user segment. The U.S. Air Force develops, maintains, and operates the space and control segments. GPS satellites provide service to civilian and military users. The civilian service is freely available to all users on a continuous, worldwide basis. The military service is available to U.S. and allied armed forces as well as approved Government agencies.
   Write about each segment and types of services provided (SPS, PPS)

   GPS uses trilateration to determine a user's position. To be able to apply trilateration, we need to know the exact distance that our GPS receiver is from the orbiting satellites to be able to calculate an accurate position.
   Distance = Speed x Travel Time

   a. GPS signals are a radio signal, therefore they travel at the speed of light
   b. If we know the time the signal was sent and the time the signal was received we can work out travel time.
   c. By subtracting the sent time from the received time, we can determine the travel time
   d. Now we can multiply travel time by the speed of light and we can determine distance

   To calculate the travel time, each satellite transmits its own pseudocode, as illustrated below. To determine distance, both the satellite and GPS receiver generate the same pseudocode at the same time. The satellite transmits the pseudocode which is received by the GPS receiver. The receiver is still producing the pseudocode while the satellite's code is travelling through the sky. The 2 signals are eventually compared and the difference between the 2 signals is the travel time.

   If we know the distance between the satellite and the receiver for:
   ● 1 satellite , the receiver's location is known within a sphere.
   ● 2 satellites, the receiver's location is known within 3D ring
   ● 3 satellites, the receiver's location is somewhere on at most 2 3D regions

   ● 4 satellites , the region gets smaller because of the sphere of the new
   Satellite
2. Image processing is the analysis and manipulation of a digitized image, especially in order to improve its quality.
   a. Spatial filtering actually changes the pixel distribution and availability by filtering some digital numbers into the output image. E.g., a low pass filter only allows low frequency DNs into the output image. On the other hand, contrast enhancement is a technique to enhance the displaying capacity of the output device, to utilize the dynamic range of 0-255 to the maximum extent. E.g., histogram equilisation
   b. In **supervised classification** the user or image analyst "supervises" the pixel **classification** process. The user specifies the various pixels values or spectral signatures that should be associated with each class. On the other hand, **unsupervised classification** is where the outcomes (groupings of pixels with common characteristics) are based on the software analysis of an image without the user providing sample classes. The computer uses techniques to determine which pixels are related and groups them into classes. The user can

specify which algorism the software will use and the desired number of output classes but otherwise does not aid in the classification process.

3. Parameters of data quality:
    a. Accuravy
    b. Presicion
    c. Consistency and
    d. Completeness

Burrough (1986) divides sources of error into three main categories:

1. Obvious sources of error.
2. Errors resulting from natural variations or from original measurements.
3. Errors arising through processing.
    Generally errors of the first two types are easier to detect than those of the third because errors arising through processing can be quite subtle and may be difficult to identify.

Expand each point with corresponding subtypes in the answer through notes given

4. Methods of partioning space:
    a. Regular Decomposition:
    b. Object-oriented decomposition
        Expand each point with the notes uploaded.

5. Types of vector spatial analysis:
    a. Query Techniques
    b. Extraction Techniques
    c. Proximity Techniques
    d. Overlay Techniques
    e. Statistical Techniques
        Expand each point with the notes uploaded.

Overlay analysis: from notes uploaded.

a text-listing of commands to be compiled

OPEN SOURCE

Open source means that the source code is available to the general public for use, distribution & modification from its original design free of charge.

OGC

open geospatial Consortium

Most of the open source geospatial software is built on the standards of the OGC.

OSGeo = organisation that supports development of highest quality open source geospatial software.

Copyright v/s copyleft

* Copyrights exist in order to protect authors of documentation / software from unauthorised copying or selling.

* A copyleft provides a method for software or documentation to be modified & distributed back to the community, provided it remains Libre.

6.

Libre : very few limitations of on distb^n / improvement.

GNU - GPL   or   GPL

* General Public License is a widely used free - software license, which gearantees end - users the freedom to run, study, share and modify the & software.

* GPL is a copy-left license.

* QGIS license.

GDAL (Raster)   OGR (Vector)

Geospatial Data abstraction library / OpenGIS simple features ref. implementation

* GDAL is a translator library for raster & vector geospatial data formats that is released under MIT open source license by OSGeo project.

SUNDAY 29

* GDAL used to design raster part of the library and OGR - the vector part.

* As a library, it represents single raster abstract data model and single vector abstract data model to the calling application for all supported formats.

MAY - 2018
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WMS.   (Web map service)

interface

The Open GIS WMS std. provides a simple HTTP interface for req. geo-registered map images from one or more distributed geospatial databases.

WFS   (Web feature service)

- interface std.
- provides an interface allowing requests for geographical features across the web

Plugin :-

- a piece of software functionality.
- can be attached to application as a macro.
- best way to share & use application specific functionality.

eg, autotrace, (add)input etc.

Open source GIS software:
Overview of QGIS:

QGIS is a free and open-source cross-platform desktop geographic information system application that supports viewing, editing, and analysis of geospatial data. QGIS offers many common GIS functionalities provided by core features and plugins, such as:

a. View data

b. Explore data and compose maps

c. Create, edit, manage and export data

d. Analyse data

e. Publish maps on the Internet

f. Extend QGIS functionality through plugins