17CV563

# Fifth Semester B.E. Degree Examination, Aug./Sept.2020
# Remote Sensing and GIS

Time: 3 hrs. Max. Marks: 100

***Note: Answer any FIVE full questions, choosing ONE full question from each module.***

## Module-1

1 a. Define Remote Sensing. Illustrate the applications and limitations of it. **(10 Marks)**

b. Enumerate the multi-concept of Remote Sensing. **(10 Marks)**

**OR**

2 a. Describe the Basic principles of Remote Sensing. **(10 Marks)**

b. Illustrate the Electromagnetic spectrum and its characteristics. **(10 Marks)**

## Module-2

3 a. Enumerate the sensors and platforms briefly. **(10 Marks)**

b. Describe briefly landsat and IRS satellites. **(10 Marks)**

**OR**

4 a. Explain briefly high resolution sensors. **(10 Marks)**

b. Define an image and explain the image interpretation procedure. **(10 Marks)**

## Module-3

5 a. Define the GIS and explain the components of GIS. **(10 Marks)**

b. Explain the data acquisition mechanism in GIS. **(10 Marks)**

**OR**

6 a. Briefly explain spatial and attribute data. **(10 Marks)**

b. Explain briefly types of map projections. **(10 Marks)**

## Module-4

7 a. Define a spatial data model and explain its types. **(10 Marks)**

b. Define Topology and explain its importance. **(10 Marks)**

**OR**

8 a. Illustrate the vector and craster data models in GIS. **(10 Marks)**

b. Explain briefly the database management in GIS. **(10 Marks)**

## Module-5

9 a. Explain the applications of remote sensing and GIS in urban planning. **(10 Marks)**

b. Explain the significance of GIS in road accident analysis. **(10 Marks)**

**OR**

10 a. Enumerate the application of Remote sensing and GIS in landuse and land cover mapping. **(10 Marks)**

b. Explain the applications of Remote Sensing and GIS in water Resources management. **(10 Marks)**

Solution 17CV563

Marks. 100. VI$^{th}$ Sem B.E Degree Examination Aug/Sept

Time :- 3 hrs Remote Sensing & GIS (18CV651) 2020

## Module-1

1. a) Define Remote Sensing. Illustrate the applications & limitations 10 marks

Solu$^{n}$ :- Generally Remote sensing refers to the activities of recording observing / percevivig (sensing) objects or event at farnway (mobile) Places.

Remotes Sensing is the object Science and art of obtaining information about an object, area or phenomenon. through the analysis of data, acquired by device, that is not in Contact with the object, area or phenomenon under investigation

Applications & limitations of Remote Sensing.

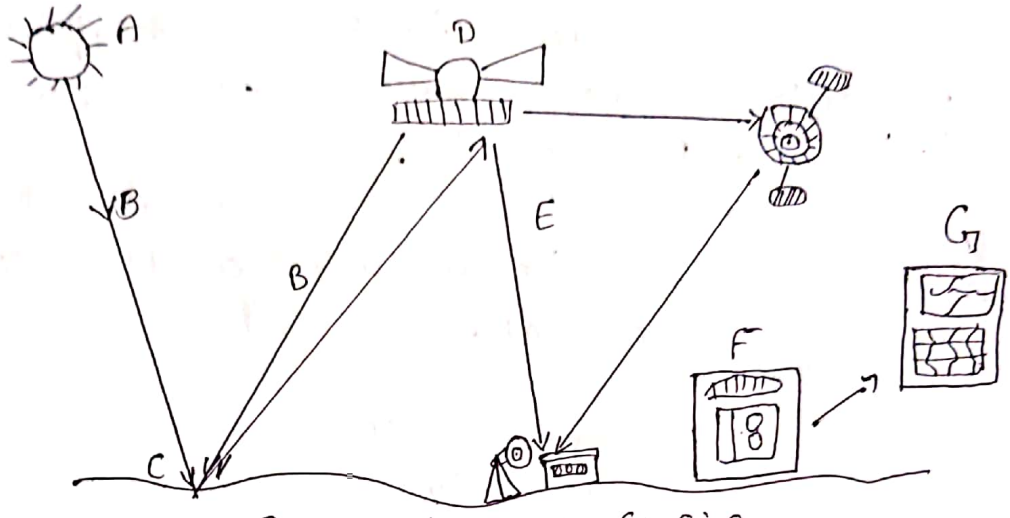
Advantages

1) Satellite images are permeanent records, providing useful information in various wave bands.
2) Large area coverage enables Regional Surveys on variety on a variety of themes & identification of large files.
3) Respective coverages allow monitoring of dynamics theme like water, agriculture etc.
4) A Single remotely Sensed image can be analysed & interpt for different purpose and applications.
5) Map revision at medium to small Scales is economical.

Limitation

1) The interpretation of imagery require acertain skill level
2) Needs Cross Verification with Ground. Survey data.
3) Data from multiple Sources may create confusion. Solution.
4) objects can be misplaced or confused.
5) Distortions may occurs in an image due to. relative motion of Sensor & source.

2 a) Describle principle of Remote sensing.




Principle of Remote Sensing

+ Energy Source or Illumination (A) :- The first requirment for remote sensing is to have an energy source which illuminates or provides electromagnetic energy to the target of Intrst.

+ Radiation & the atmospheric (B) :- as the energy travels from its source to the target through. It comes in contact with and intract with atmosphere it pass through.

+ Intraction with the target (c) :- once the energy makes its way to the target through the atmosphere, it Intracts with the target depending on the properties.

* Recording of energy by the sensor (D) :- after the energy has been scattered by or emitted from the target. we require a sensor to collect & record the electromagnetic radiation.

* Transmission, Reception & processing (E) :- The energy recorded by the sensor has to transmit, often in the electronic form to a receiving & processing station where the data are prossed into an image.

* Interpretation & analysis (F) :- The processed image is interpreted vissually & digitally or electronically to Extract information from image about the target in order to better understand it.

* Applications (G) :- The final element of the Remote Sensing Processed is achived when we apply the information which we have been able to Extract.

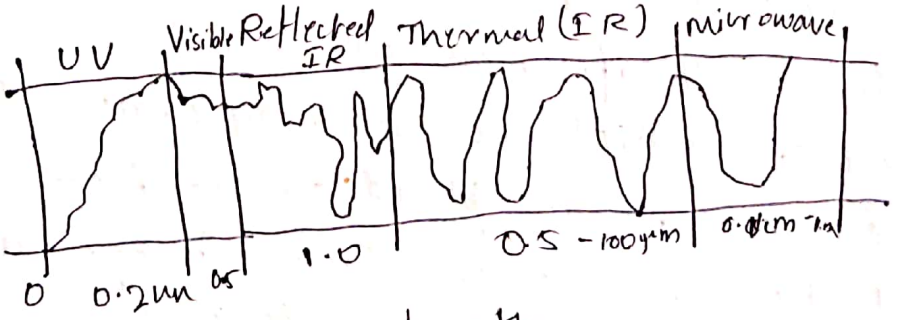
1b. Enumerate the multi concept of Remote sensing.

Solution Before radiation reaches the earth surface it has to travel through atmosphere. Particles and gases in the atmosphere can effect the incoming light & radiation these effects are caused by the mechanisms of scattering & absorption.

Scattering:- occurs when particles or large gas molecules present in the atmosphere intrack with & causes the electromagnetics radiation to be redirected from its original path. How much scattering takes place depends on several factors including the wavelength of the radiation, the abudence of particles or gases and the distance the radiation travells through the atmosphere. These ~~are~~ 3 types of scattering takes place. Rayleigh Scattering, Mie Scattering, Non Selective.

Atmospheric Transmission windows:-

Some types of electromagnetics radiation easily pass through it is refered to as its transmissility. and varies with the wavelength or type of radiation The gas that comprise our atmosphere observe radiation in certain wavelength while allowing radiation with different wavelength to pass through



2. b. Illustrate the Electromagnetic Spectrum & its charaltrs

Soluf:- Electromagnetic waves are energy transported through Space in the form of periodic distrubution of Elect. and magnetic fielld. All electro magnetic waves thevel through Spuce in the speed of light i.e $c=3\times10^8$ -An electromagnetic wave is characterized by frequency and wavelength.

The wavelength is the length of one wave cycle. which can be measured as the distance b/w Successive wave crests. wavelength is usually represented by Greek letter.

$$C = \lambda \times n$$

where $\lambda$ = wavelength (m)

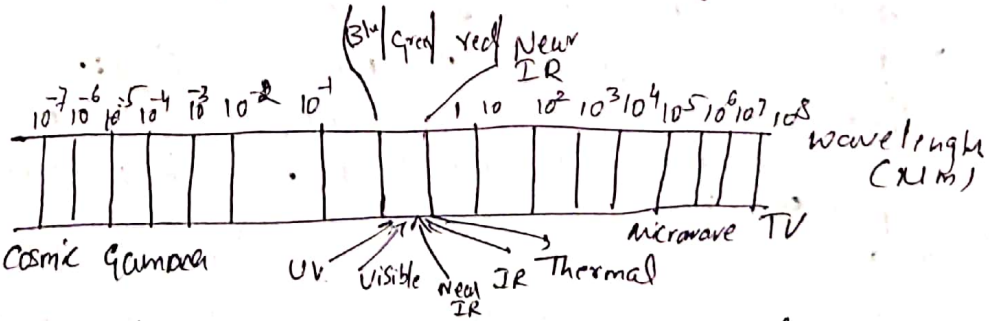
$n$ = frequency. ($Hz$)

$C$ = speed of light ($3\times10^8$ m/s)

Bands used in Remote sensing

The electro magnetic Radiation (EMR), which reflect or Emitted from an object is the usual source of time Remote Sensing data.

The wavelength regions of electro magnetic Radiation have different Names ranging from Gamara ray, X ray UV ray, visible ray, Intra ray (IR) to radio wave. in order from the shorter wavelength




The optical wavelength region, an imp region for remote Sensing application is further Subdivicled. Microwave (1mm to 1m) portion of Em Spectrum that is frq used to gather valuble remote Sensing information

Module - 2

3a. Enumerate the Sensors & platform briefly.

Solu :- Indian Satellites and platforms.

Remote sensing platforms

The base stationary or moving on which remote sensing sensors are mounted is called remote sensing platforms. The remote sensing platforms ranges from camera on a tripod or a cherry picker stand on the ground to ballons, helicopters, rackets, aircrafts & space craft. platform is a stage to mount the camara or sensors to acquire the information about a target under investigation.

Essentially 3 different types of platforms are used to mount the remote sensors where from they collect information on Earth's surface features & record / transmit the information to the with receiving station for their for the analysis & interpretation.

These sensors platforms are

1. Ground based platform
2. Air bore observe platiform
3. Space borne observe platform

Indian Satellites & sensors characters.

| | |
|---|---|
| 1) Bhaskara 1 & 2 :- | 1) Linar Imaging |
| 2) IRS 1A & IRS 1B | 2) wide field |
| 3) IRS P2 | 3) Advance wide field |
| 4) IRS 1C & IRS 1D | 4) PAN fore/Aft |
| 5) IRS P3 | |
| 6) IRS P4 | |
| 7) IRS P6 | |
| 8) Oceansat | |

3 b. Describe briefly landsat & IRS satellite

Landsat Satellite programme.

National Aeronautics & Space administration (NASA) of USA with coorporation of USA department of Interior planned the lauching of Series of Earth resources Technology Satellite (ERTS) ERTS-1 was lauched by a Thor-delta rocket on July 23 1972. and it oprated until Jan 6. 1978. It represented 1st unnamed satellite designed to aquire data about the Earth recouses on a systemahic repetitive, medium resolution, multispectr basis. Subsequently, NASA renamed the Earts Progam as Landsat programe to distinguish it from the Series of metrological & ocean graphic Satellite that the USA laughed later. ERTS-I was retos respectively Named Landsat-I, five landsat satellite have been lauched so far and this, Experimental programme has envolved into an an oprational global resource monitoring programe.

| feature | Landsat 4&5 | Landsat 7 |
|---|---|---|
| Altitude | 904 km | 705 km |
| Orbital Period | 103.2mm | 98.9 min |
| Thermal Resoluti | 22day | 16 days |
| Equatorial Crossing time | 10am Local Sun time | 10am Local Sun time ±5m |
| Sensor swath(Km) | TM | ETM + 183X 170Km |
| Resolution (M) | 72.5 | 30m multispectr<br>60m Thermal<br>15m Panchromatic |

4a) Explain briefly high resolution sensors

i) multispectral scanner (MSS) used in Landsat Series

Multispectral scanner (optical mechanical scanner) on board landsat Series of satellite of USA (L1, L2, L3, L4, L5) gives line scan type imagery using an oscillating mirror to continously in each of the four Spectrul bands for each mirror sweep.

(ii) Return beam vidicon (RBV) used in Landsat

Return beam vidicon on board Landsat 1, 2, & 3 is a camera system which oprates by shuttering 3 indeped. camera (2 in case of L3) Simultaneously, each Sensing a different Spectrul band in the range of 0.48 to 0.83 um.

(iii) Thematic mapper (TM) used in landsat Series Satlite

Landsat 4 & 5 have on board a new playload called Thematic mapper with 7 Spectral bands & Ground resoultion of 30mt. This is an addition to the MSS playload.

(iv) SPOT Satellite program

France, Sweden & Belgium joined together & pooled up their resources to develop the system poulin observation dela Terra (spot), an earth observat Satellite programe. in Feb 21, 1986.

(v) High resolution visible (HRV)

The french SPOT-1 Spacecraft carries two nominally identical High resolution visible (HRV) imagers.

(vi) Cartosat

The cartosat Series of satellite are a type of earth observation satellites indigenosly built by India upto till Now 6 cartoSat Satellite have been launched by ISRO.

4b. define an image & explain image interpretation.

Sol:- A digital remotely used image is typically composed of picture element (pixel) located at the intersection of each row i & column j in each k bands of image Associated with pixel is a number known as Digital Number (DN) or Brightness Value (BV), that depicts the avg. radiance of relative small area with scene.

## Basic of image interpretation

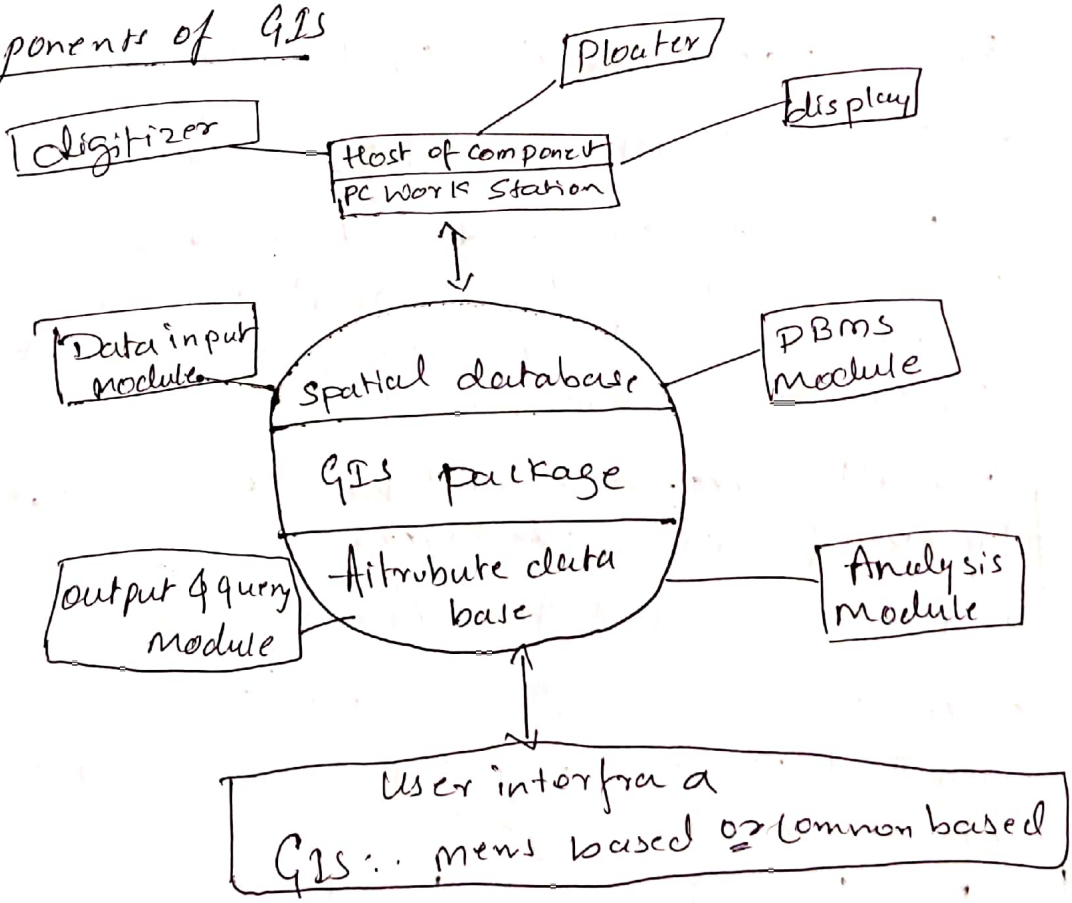
1) Location :- Analysis approch to remote sensing imagery ~~the~~ area of Lection.
2) Size :- Its a objects in an image is functional scale It is imp to Assess the size of a target relative to other.
3) Shape :- refers to the general form of structure or outline of individual objects.
4) Shadow :- helpful in interpretation as it may provide an idea of the profile and relative hiaght of the target
5) tone/colour :- It refere to the relative brightness or colour of object in an image,
6) Texture :- arrangment and frequency of tonal Variation in particular areas of an image.
7) Pattern :- refers to the spatial arrangment of visibly discernible object.
8) height/depth :- It refers the object diemetric with respect to the scale.
9) Site/ situation / Association :- It takes into account the relationship b/w other recognizable objects or features in proximity to the target of interest

5q. Define the GIS & Explain the components of GIS.

The association for the geographic information defines GIS as:- a system for capturing storing checking Integrating manipulating analysing and displaying data which are Specially referenced the Earth

A Similar working definition of GIS:- a computer based approch to interpreting maps & images & applying them to problem solving.

Components of GIS




Components of Important Systems

1. computer Hardware
2. Set of application Software module
3. and a proper organisation Content

Hardware component of GIS

1) CPU 2) digitizer 3) Tape drive 4) display

5b) Explain the data aquision mechanism in GIS

A geographical reference object has two main component
Spatial data representing its location.
Attribute data representing its characters.

→ Spatial data.

Spatial data (mapable) of Georeferencing data is commonly characterized by the presence of two fundent Components

1) The physical dimension or class that is the phenome being reported.

2) The Spatial location of the phenomeal.

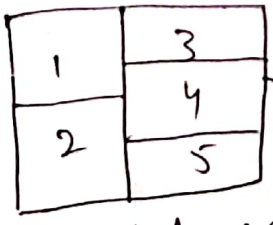
→ Non Spatial / attribute / tabular data.

These are usually data tables that contains information about the spatial components of the GIS Theme. This can be numeric & character data such as Timber type, volume, road size, well depth etc.

The attributes are related back to the Spatial features by use of unique identifyers.

→ Joining Spatial & attribute data

often, most intresting about the maps is not the individual a year but the relationship b/w the features in those layer.




Road layer

| Name | ID | data |
|---|---|---|
| Kings way | 1 | 22-02-04 |
| university | 2 | " |
| Avenue | 3 | " |
| Dunsta | 4 | " |
| St. George | 5 | " |

| ID | Class | No. of Layer |
|---|---|---|
| 1 | 1 | 4 |
| 2 | 1 | 2 |
| 3 | 1 | 2 |
| 4 | 2 | 2 |
| 5 | 2 | 2 |

Roadattribute data

6a) Briefly explain Spatial & attribute data

Sol$^n$ - Spatial data

Spatial data (mapble) of georeference data is commonly characterized by the presence of two fundamental components

1) physical diamension
2) spatial location

Non spatial data / Attribute data

These are usually data tables that contains information about the spatial components of the GIS Theme. This can be numeric & character data such as objects present on Earth.

The attribute are related back to the spatial features by use of unique identifiers that are stored both with the attribute tables and the features in Each Spatial data layers. attributes can be either qualitative (low, medium, high) or quantitative (actual measurment) The data base allows us to manipulate information in many ways :- from simple listing of attributes, sorting features by some attiribut Grouping by attributes are seleching & singly out group of attribute.

We can use the additional information to quarry your data in new ways. while you can also select features in one layer based on their location.

The Geo relation data module stored attribute that are seprately from spatial data in split system Available the object based data model.

6 b) Explain types of map projection.

Sol: A map projection is a method by which the curved surface of the earth is peprented of flat surface & it involves the use of mathematical transformation b/w the location of the place on the Earth & they projected location on the plane. When the curved surface of the Earth is shown on the flat sheet some distortion is inevible The distortion is relesed when the map only shows small area & maximum when the map shows entire surface of the Earth.

## Types of map projection

Map projection can be grouped either by preserved properties of the projection surface.

Based on the preserved property map projection are classified as

* conformal projection
* Equalent projection or Equal-area prejection.
* Equidistant projection
* Azimuthal projection

→ conformal projection :- It project local angle & shape Conformal projections are those on which any small

7. a) Vector Data model

Vectors are ghaphical objects that have a geometrical primitive such as point Lines & Polygons to represed geogsaphical entities in a computer graphics. Vectors have precise direction length & shape & can be defined by Co-ordinate geometry.

Vector model is close to traditional mapping approach with objects are represented as points lines are areas.

Vector model is ideal to represed discrete entities. Point Lines & areas.

Raster Data model

Raster organises special features in a regularly spaced grid of cells as pixels. Raster data represent points with single cells Lines with sequence of neighbouring cells & area collection of Continuous cells.

As a Traditional raster image x-axis is column Indicator & y axis is arrow Indicates. Not only geometric Data But other picturing Kal data can also be represented & stores.

7b) Topology

In GIS it can be defined as set of objects and object that defines the relationship Between the objects. The is a conceptual representation of special features as point lines & areas in vector model. Topology refers to relationship Between spatial objects.

Importance of Topology.

- Assurance of Data quality.

Topological relationship enables us to detect error such as lines that do not meet correctly or poly cones that are not closed properly. These kinds of errors must be corrected to avoid incomplete features & ensure Data Integrity.

- Topology can enhance GIS analysis.
- Topology is necessary for certain special features such as network routing through linear networks coverage & its Data structure.
- Topology leads to enhancing Data Inputs in every aspect of GIS analysis.

8. a) Vector Data model.

* Vectors are graphical objects that have a geometrical primitive such as point Lines & Polygon to represent geophical entities in a Computer ghaphics. vectors have precise direction length & shape & can be defined by Co-ordinate geometry.
* Vector model is close to traditional mapping approach with objects are presented as points Lines are areas.
* Vector model is ideal to represent discrete entities. Point Line & areas.

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7b) Topology

8b) Data conversion is a standard functionality in a GIS package. The conversion of vector data to raster is called rasterization & the conversion of raster data to vector data is called vectorization.

The simplex of two conversion methods rasterization involves basic steps.

*) First step sets of raster with the specified service size to convert the area extent of the vector data.

*) Second steps changes the values of those cells that corresponds to points, lines & polygons boundaries. The cell value is set of 1 for a point, the lines values for a line & a polygon value for a polygone.

*) Third step fills the interior of the polygon outline with the polygone value comes from rasterization, usualy related to design of computer algorithm size of raster cells & Boundary complexity.

9.b) GIS was used as a management system for accident analysis by applying combination of spatial-statistical methods. The operational approach of spatial pattern was developed in geographical information system (GIS) framework to analyse three types of urban accidents (Fatal, injury & property damage)

It goes without saying that road & traffic information is crucial data for city. Road traffic managers normally organise this material by compiling the data into tables used in statistical analysis. However as the volume of data is huge & multifaceted relations of data are involved it becomes very difficult to administer them consistently.

And here's where applying GIS technology to the structure of the database helps in handling the positions & properties of clients visually.

9.93 Remote sensing spatial queries and environment data analysis help urban planners find areas of environmental sensitivity. By overlaying existing land development on land stability maps they can identify any areas of conflict between the environment & potential developmt.

The urban planning application using R.S & GIS tools is one of the many areas where such utilities can be used for managing planning activities. The planner can look for different options & choose the best suited for the end result. The automated process is not only faster but also can be monitored effectively at any eventuality.

Few of the application.

- Base map preparation process
- urban land suitability analysis.
- monitoring Temporal changes, urban growth, land use changes.
- Location Analysis
- optimal Route Analysis
- Terrain modelling
- Green cover mapping in urban area.
- mapping urban Heat island.

10 a) Enumarate the applications of Remote Sensing and GIS in ~~Urban planning~~ landuse & land cover.

Sol:- The land use and land cover pattern is an outcome of natural and Socioeconomic activities over the earth surface WR-6 is sub watershed of wardha river basin which cover 3488 sq. km. Remote sensing & GIS techniques are used to view, intrepret & anaulyse data from a geograp perspective Ground truth verifications were also Performed through field work to check the accuracy of the classification. Remote Sensing provides synoptic view and multitemprol data for land use and land cover mapping:

Information about land cover and land use is very important component of the planing process as it can contrubute to the debate on the current arrangment and pattern and the need to modify land use as part of regional plan. resource development or managment project an environment planning exrcise or as a baseline study of economical outcome or as part of an environmental conservation or Sustainability project or to avoid some predicted future unwanted consequence. Access to accurate land use maps can assist planner and the enterprise of planning. It is in this context that remote sensing is able to contrubute The purpose of this monograph is to present.

10b) Explain the Applications of Remote Sensing & GIS in Water Resource managment

The ability of Remote sensing to contribute to the mandate of planner and manner has changed significately over the last decade. Satellite data are now available that can be used to map and monitor change from Continental to the local scale with the recent launch of satellite capable of collecting data that is comparable to aerial platform there is an enchansed capability of identifying change at small spatial cases Similiarly advances in image processing data base management and spatial analysis tool have enhansed our ability. to analysis of these data for depicting land cover & land use change Here, Remote sensing technology are described along with methods.