

TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2082 Chaitra

| Exam.       | Regular |            |        |
|-------------|---------|------------|--------|
| Level       | BE      | Full Marks | 80     |
| Programme   | BCT     | Pass Marks | 32     |
| Year / Part | IV/ II  | Time       | 3 hrs. |

**Subject:** - Remote Sensing (Elective III)(CT 78501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Define remote sensing. Describe the components of remote sensing with an example. [2+6]
2. Explain plank investigation of electromagnetic radiation based on quantum theory. And calculate the energy of a single photon at  $0.5\mu\text{m}$ . [4+4]  
where, Plank Constant ( $h$ ) =  $6.63 \times 10^{-34} \text{ W s}^2$ .
3. Describe in detail about the types of platforms used in remote sensing with an example of any applications. [8]
4. Evaluate various factors in determining the range equation of the radar system for a distributed target. And find the most dominant factor that influence the radar range. [4+6]
5. Explain in detail the continuous wave radar and FMCW radar with block diagram. A target is approaching radially to a radar with relative velocity of 300 km. The radar transmits continuous wave energy at a wave length of 10cm. Find the Doppler shift of the target. What will be the Doppler shift if the target alters its course by  $60^\circ$ ? [6+2+2]
6. What are the important factors which determine the quality of the image? Describe the general mode of image scanning which can be carried out. [4+6]
7. Describe briefly about the future trends in remote sensing. And also explain information delivery system of remote sensing with diagram. [4+6]
8. Write short notes on: (Any Four) [4×4]
  - a) Geosynchronous orbit
  - b) GIS
  - c) Multispectral Scanner
  - d) Temporal resolution
  - e) Moving Target Indicator (MTI) Radar

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TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2078 Chaitra

| Exam.       | Regular  |            |        |
|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Explain in detail, process of satellite remote sensing with suitable diagrams. List out and justify the major application area of remote sensing. [6+4]
2. Derive the basic form by radar range equation by including and explaining the terms – average power, duty cycle, noise figure, PRF, pulse width, noise bandwidth and relevant parameters. [10]
3. Calculate the maximum range of a radar system which operate at 5.6 GHz with peak power of 279 kW, if its minimum detectable signal is  $10^{-8.3}$  watts, the effective aperture size of its antenna is  $5 \text{ m}^2$  with gain of 3940. Assume that the radar is used to detect a helicopter. Calculate also the sixth blind speed with the PRF of 638.5 Hz if the helicopter is flying with a speed of 40 m/s. [8+2]
4. Considering following parameters, calculate and compare orbital parameters of LEO and GEO. [10]  
 Gravitational Constant,  $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{Kg}^{-2}$   
 Mass of Earth,  $E = 5.983 \times 10^{24} \text{ Kg}$   
 Radius of earth = 6356.8 km
5. Provide the key specifications of any one of operational remote sensing satellites and its remote sensing sensor. Explain about its observation geometry and application. [10]
6. Prepare a specifications of any one operational remote sensing satellite and highlight its applications. [10]
7. Write short notes on: (Any Four) [4×5]
  - a) Radar display systems
  - b) Spectral Radiance
  - c) GIS in Remote Sensing
  - d) Remote Sensing Image Analysis
  - e) Clutter cancellation in MTI

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TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2077 Chaitra

| Exam.       | Regular  |            |        |
|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Which three bands of the electromagnetic spectrum are most useful in remote sensing? Describe the remote sensing in Nepal. Explain seven basic different processes of remote sensing. [1+2+7]
2. Explain how the Plank's blackbody energy distribution is important to remote sensing. Make clear based on features of the distribution, using figures where appropriate. [8]
3. For what temperature is the peak of blackbody radiation spectrum at 400 nm? If the temperature of a blackbody is 800 K, at what wavelength does it radiate the most energy? [4+4]
4. Evaluate various factors in determining the range equation of the radar system for a distributed target. Proof that the transmitted power is the most dominant factor that influence the radar range. [6+4]
5. Derive and evaluate an expression relating the orbital period T, of a satellite in a stable MEO orbit, to its altitude above the Earth's surface, h. [8]  
(Use Earth's mass =  $5.983 \times 10^{24}$  kg;  
universal gravitational constant =  $6.67 \times 10^{-11}$  Nm<sup>2</sup> kg<sup>-2</sup>;  
radius of the Earth =  $6.38 \times 10^6$  m).
6. Provide the specification of any one of operational remote sensing satellites. Explain about its observation geometry and application. [6+6]
7. Differentiate continuous wave Radar and FMCW radar with necessary diagram. A target is closing radially to a radar with a relative velocity of 200 km. The radar transmits continuous wave energy at a wave length of 5 cm. Find the Doppler shift of the target. What will the Doppler shift if the target alters its course by 45°? [6+2+2]
8. How can we use GIS for decision making approach? [6]
9. Explain briefly how delay line helps in processing of MTI. [8]

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TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2076 Bhadra

| Exam.       | Regular / Back |            |        |
|-------------|----------------|------------|--------|
| Level       | BE             | Full Marks | 80     |
| Programme   | BEX, BCT       | Pass Marks | 32     |
| Year / Part | IV / II        | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT 78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Prepare a complete suitable specifications of a pulsed radar to detect a bird flying away from a radar station. [10]
2. List out the information given by RADAR and its applications. With respect to the principle of operation. Differentiate between CW Radar and FM-CW Radar with necessary diagrams. [2+8]
3. Assume you are assigned to uplift the height of an LEO orbiting at the height of 550km to 800km. Give a solution and compare these situation from view points of orbital parameters and geometrics. [use:  $M_E = 5.983 \times 10^{24}$  kg;  $G = 6.67 \times 10^{-11}$  Nm<sup>2</sup>kg<sup>-2</sup>,  $R_E = 6.38 \times 10^6$ m.] [10]
4. Provide the specification of any one of operational remote sensing satellites and its remote sensing sensor. Explain about its observation geometry and application. [5+5]
5. Discuss any one application of remote sensing highlighting its technological and application merits. [10]
6. Explain the different spectrum used for remote sensing. Explain different mechanism of interaction of radiation from energy source with the target in remote sensing. [3+7]
7. How remote sensing data are processed and classified? Explain. [10]
8. Write short notes on: (*Any Two*) [5×2]
  - a) LIDAR Remote sensing
  - b) Spectral resolution Versus radiometric resolution
  - c) Importance of Remote Sensing in the Himalya

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INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2075 Bhadra

| Exam.       | Regular  |            |        |
|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Choose a suitable radar system to track a moving target in the presence of strong ground clutter; and explain its working principle with suitable diagrams. [10]
2. With arbitrarily defined orbital observational parameters design observation geometries of a radiometer and a pulsed radar onboard a same remote sensing satellite and discuss. [10]
3. Consider a bistatic radar system and derive basic range equation incorporating Noise Figure (F). [10]
4. Explain how a radiometer works to monitor spectral reflectance from ice-covered mountains. [10]
5. With self-defined variables approximate and illustrate the key orbital parameters (namely, orbital period and satellite height) of a GEO. [Consider the gravity constant (G)= $6.6720 \times 10^{-11}$  in  $\text{N.m}^2.\text{kg}^{-2}$ , Earth mass (M)= $1.9891 \times 10^{30}$  in kilograms, and earth equatorial radius (R)= $6378 \times 10^3$  in meters.] [10]
6. Write short notes on:
  - a. Spectral radiance
  - b. CW-radar
  - c. GIS architecture
  - d. PPI display

[4 x 5]
7. Based on theoretical aspects and by providing technical specifications explain any one of remote sensing applications. [10]

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36A / TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2074 Bhadra

| Exam.       | Regular  |            |        |
|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject:** - Remote Sensing (Elective III) (CT78501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain working principle of Moving Target Indicator (MTI) radar with its block diagram. [8]
2. Provide the specifications of anyone remote sensing satellite having remote sensing sensor. Explain about its observation geometry and application. [8+6]
3. Provide the range equation of Radar, Lidar and Black body radiation equation with necessary illustration. [10]
4. Find the orbital elements: eccentricity and angular momentum, with given state vectors, [4+4]  
$$\mathbf{r} = -6045\hat{\mathbf{i}} - 3490\hat{\mathbf{j}} + 2500\hat{\mathbf{k}} \text{ (km)}$$
$$\mathbf{v} = -3.457\hat{\mathbf{i}} + 6.618\hat{\mathbf{j}} + 2.533\hat{\mathbf{k}} \text{ (km/s)}$$
5. Explain the concept and role of GIS in remote sensing. [6]
6. Consider a long track scanning airborne active remote sensor and provide its observation geometry with arbitrarily defined observation parameters. [8]
7. Explain briefly about radar application. Calculate the duty cycle and transmitted peak power of the surveillance radar having PRF of 600 Hz, pulse width of 0.8  $\mu\text{s}$  and average power of 2 Kw. [2+6]
8. Write short notes on: [Any Three] [6\*3]
  - a. Image interpretation criteria
  - b. Highway surveillance radar
  - c. Implication of remote sensing data on machine learning
  - d. Scattering mechanism

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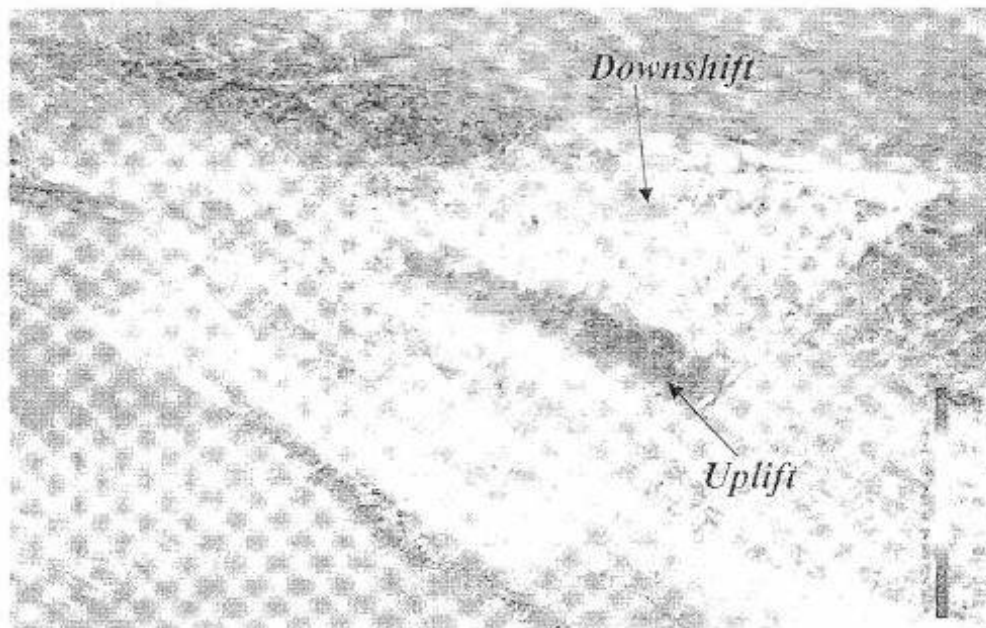
**Examination Control Division**  
**2074 Magh**

| Exam.       | Back     |            |        |
|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. With necessary figures and expressions explain how moving target indicator radar works. [10]
2. Derive and discuss how signal wavelength plays role in basic radar and lidar range equations, and Plank's blackbody radiation equations. [5+5+5]
3. Provide major orbital specifications of any one of remote sensing satellites, and sensor specifications including observation geometry of any one of sensors onboard that satellite. [5+5+5]
4. With self-defined variables approximate and compare the key orbital parameters (namely, orbital period, velocity and satellite height) of LEO and GEO satellites. Consider the gravity constant ( $G=6.6720 \times 10^{-11}$  in  $N.m^2.kg^{-2}$ , Earth mass ( $M=1.9891 \times 10^{30}$  in kilograms, and earth equatorial radius ( $R=6378 \times 10^3$  in meters. [8]
5. Write short notes (Any TWO): [2 x 5]
  - a. Highway surveillance radar system
  - b. Importance of remote sensing for mapping Himalayas
  - c. Radar display systems
  - d. Geographical Information System
6. List out remote sensing image analysis criterions and discuss them. [8]
7. A pulsed radar operating at 12 GHz has an antenna gain 25 dB, transmitter power 3 kW, and minimum detectable signal -90 dBm. The target has an RCS of 20 m<sup>2</sup>. Calculate the maximum radar range. [7]
8. Observe the attached image (**Figure 1**) and discuss how lidar may work best to confirm the shifts of the landscape. [7]



**Figure 1.** A satellite image captured, by German Aerospace Centre (DLR/EOC) with Satellite Radar Data, after April 25, 2015 around Kathmandu valley to show the changes in the topography (dark color: uplift and light color: downshift) due to the Gorkha-Earthquake 2072.

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|-------------|----------|------------|--------|
| Level       | BE       | Full Marks | 80     |
| Programme   | BEX, BCT | Pass Marks | 32     |
| Year / Part | IV / II  | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define a remote sensing. Describe the general remote sensing process with neat and well labeled diagram. [8]
2. Explain a radiation transfer mechanisms that occur in remote sensing. Explain Plank's radiation law. [5+4]
3. Describe any one remote sensing application by highlighting its applications, merits and sensing technology. [8]
4. Derive the orbital period equation of satellite motion. A satellite wishes to orbit the earth at a height of 100km (approximately 60 miles) above the surface of the earth. Determine the speed, acceleration and orbital period of the satellite. (Given:  $M_{\text{earth}} = 5.98 \times 10^{24} \text{ kg}$ ,  $R_{\text{earth}} = 6.37 \times 10^6 \text{ m}$ ). [6+6]
5. What is a GIS? Explain its model that help to provide good approach to take decision. [2+6]
6. Explain Moving Target Indicator (MTI) Radar with its block diagram. Calculate the first blind speed of a radar unit that works with the transmitting frequency of 2.8 GHz and a pulse repetition time of 1.5 ms. [6+4]
7. Describe the major representing characteristics of remote sensing images, and the general criteria of image interpretation. Observe the attached image and discuss it. [3+3+4]

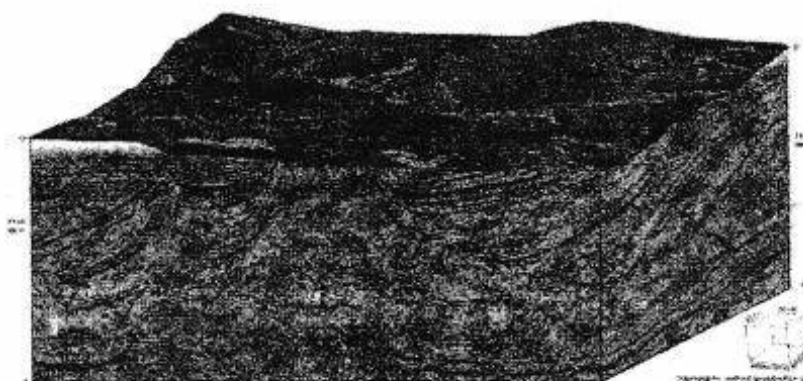


Figure: 3D seismic surveys map the layering in the subsurface, vital in oil exploration. The top surface of the cube is a satellite image draped on topography (20 times vertical exaggeration). Side faces show seismic sections through the underlying strata.

8. Write short notes on:

[5 x 3]

- a. Geo-stationary orbit
- b. Lidar
- c. Electromagnetic spectrum used for remote sensing

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TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2073 Magh

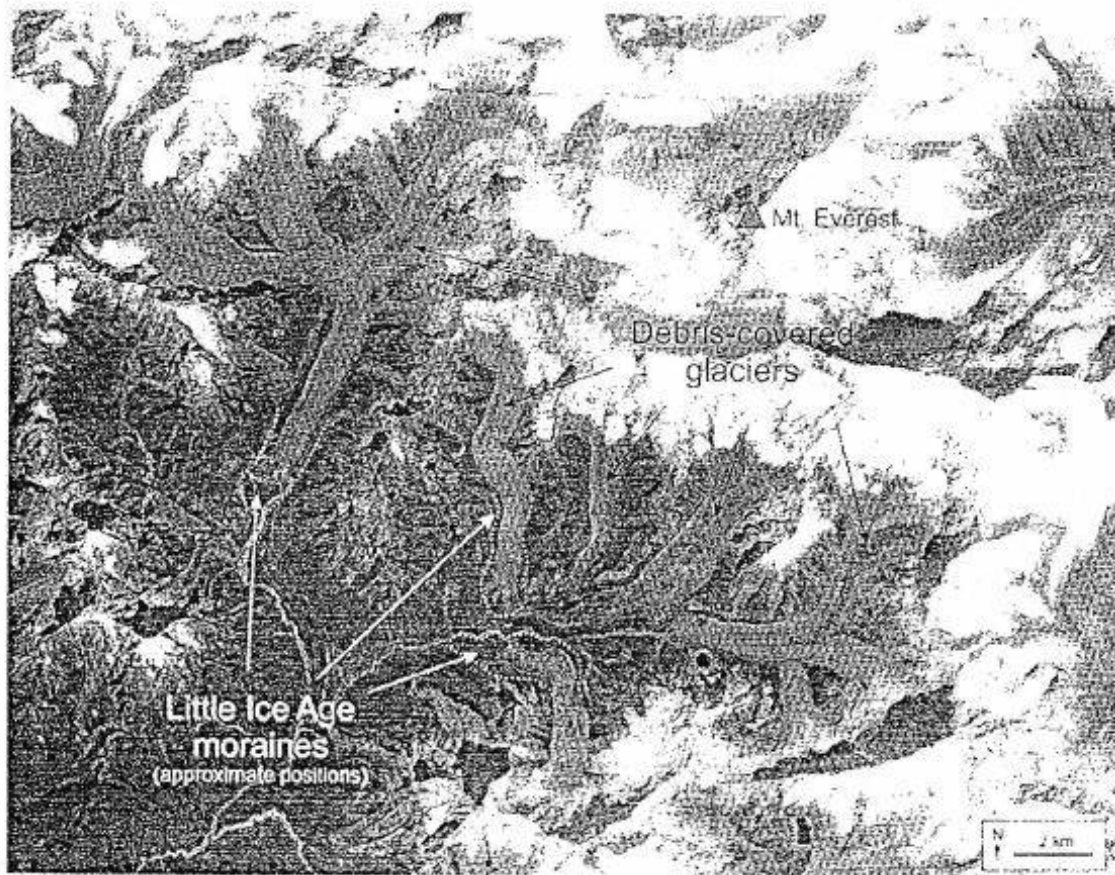
| Exam.       | New Back (2066 & Later Batch) |            |        |
|-------------|-------------------------------|------------|--------|
| Level       | BE                            | Full Marks | 80     |
| Programme   | BEX, BCT                      | Pass Marks | 32     |
| Year / Part | IV / II                       | Time       | 3 hrs. |

**Subject:** - Remote Sensing (*Elective III*) (CT78501)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Describe the multi-concept of Remote Sensing. [8]
2. Explain briefly the visual interpretation techniques for satellite data. [8]
3. Describe the different elements of image interpretation by suitably explaining how these elements are helpful in identifying different objects on the image. [10]
4. Almost every day you listen about the earthquake, giving the specific case in your area, how can you get an accurate information about the effect of earthquake? To which level is the information accurate? What measures can you suggest to make the information source more accurate to the required level? [10]
5. What is an active remote sensing? With the essential example, explain how the active remote sensing are being used as an advantage over the passive remote sensing. [3+5]
6. Derive the Radar equation in which radar remote sensing system is used to track a point moving target. [8]
7. Write short notes : (Any three) [3×4]
  - a) Spatial and Spectral Remote Sensing
  - b) Data modeling and Data Output
  - c) Atmospheric Window
  - d) GIS
8. Explain different mechanisms of interaction of Radiation from energy source with the atmosphere in remote sensing. [8]

9. Observe the attached image on the figure below. The image is the satellite image of the Everest region, it highlights the debris-mantled glaciers and their Little Ice Age moraines. List out your observation with justification based on sensing principles. [8]



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| Exam.       | Regular  |            |        |
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**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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- ✓ Assume suitable data if necessary.

1. Choose a suitable active remote sensing system to track a moving target and explain its working principle. [8]
2. Consider two radiometers onboard a remote satellite and onboard an aircraft have IFOV size of  $8 \text{ km}^2$  and  $6 \text{ km}^2$ , respectively and they are looking downward the same swath of  $72 \text{ km}^2$ . Design suitable observation geometries and compare. [8]
3. With self-defined variables approximate and illustrate the key orbit parameters (namely, orbital period and satellite height) of a LEO. Consider the gravity constant ( $G$ ) =  $6.6720 \times 10^{-11} \text{ N.m}^2.\text{kg}^{-2}$ , Earth mass ( $M$ ) =  $1.9891 \times 10^{30} \times 10^{30.035 \times 10^{-7}}$  in kilogrammes and earth equatorial radius ( $R$ ) =  $6378 \times 10^3$  in meters. [6]
4. Explain how a lidar system works best to monitor atmospheric pollutants. [7]
5. What is GIS? What are its key component? How GIS is fruitful for human being. State its limitations. [10]
6. Observe the attached image in figure below and list out your observations with justifications. [6]

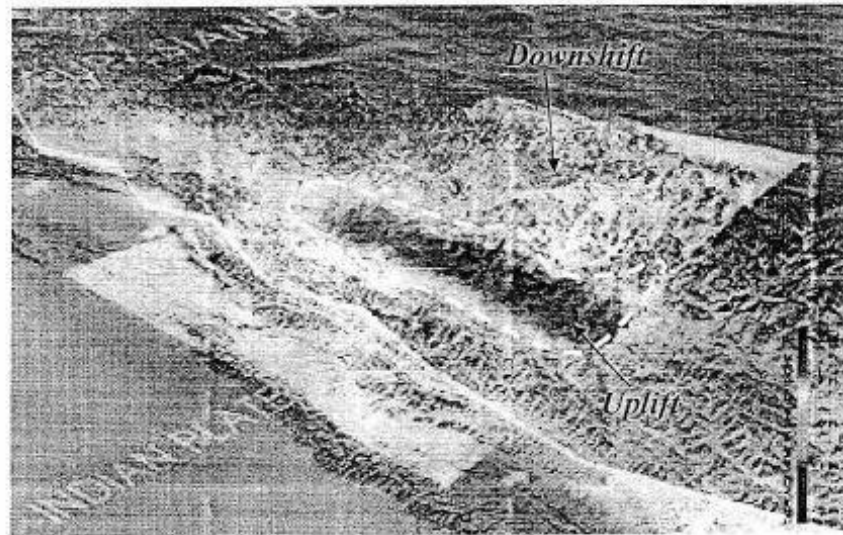


Figure 1. A satellite image captured, by German Aerospace Centre (DLR/EOC) with Satellite Radar Data, after April 25, 2015 around Kathmandu valley to show the changes in the topography (dark color: uplift and light color: downshift) due to the Gorkha-Earthquake 2072.

7. Find one of remote sensing applications justify its theoretical aspect. [6]
8. In a satellite remote sensing having the altitude,  $h$  of a satellite in a stable low Earth orbit, to the orbital period,  $T$  and angular velocity  $\omega$ . calculate the orbital period of a near polar orbiting platform, at an altitude of 705 km. If the platform carries an imager with a swath of 2100 km, what is the repeat time of the instrument at the equator, in days? Where universal gravitational constant ( $6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$ ); Earth mass is ( $5.983 \times 10^{24} \text{ kg}$ ) and radius of earth is 6356.8 km [8]
9. Write short notes on: [5×3]
- i) Spectral signature
  - ii) Multispectral scanner
  - iii) Image resolution
  - iv) Atmospheric window
  - v) Merit and demerits of microwave remote sensing
10. What is radiometry? Express plank's radiation law. [6]

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(2)



45A TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2072 Magh

| Exam.       | New Back (2066 & Later Batch) |            |        |
|-------------|-------------------------------|------------|--------|
| Level       | BE                            | Full Marks | 80     |
| Programme   | BEX                           | Pass Marks | 32     |
| Year / Part | IV / II                       | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. What is remote sensing? Explain its basic components in terms of space borne sensing. [2+8]
2. Explain the emission and radiation principle which is used in remote sensing. Explain what is blackbody radiation. [4+4+2]
3. Explain the principle of active and passive remote sensing with examples, and illustrations. [5+5]
4. What is Lidar remote sensing? Explain its principle with basic range equation. [2+6]
5. Consider two spectrometers onboard an aircraft and a satellite having 1 Fovs of  $6 \text{ km}^2$  and  $8/\text{km}^2$  respectively. Design their geometry in a same swath width of  $72 \text{ km}^2$ . [10]
6. What is GIS? Explain its models that help to provide good approach to take decision. [2+6]
7. What are the characteristics of images for the analysis? Explain its importance in remote sensing. [4+4]
8. How remotely sensed data are processed and classified? Explain. [8]
9. Draw the viewing geometry of a ground based Radar remote sensing techniques. [8]

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36A TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2071 Bhadra

| Exam.       | Regular / Back |            |        |
|-------------|----------------|------------|--------|
| Level       | BE             | Full Marks | 80     |
| Programme   | BEX, BCT       | Pass Marks | 32     |
| Year / Part | IV / II        | Time       | 3 hrs. |

**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Necessary figure is attached herewith.
- ✓ Assume suitable data if necessary.

- 1 Define a remote sensing. Describe the general remote sensing process with neat and well labeled diagram. 3+7
- 2 Explain briefly about how ultraviolet, visible, Infrared and microwave region are used for remote sensing process. 7
- 3 Explain different mechanisms of interaction of radiation from energy source with the atmosphere in remote sensing. 8
- 4 Describe the basics of airborne and space borne sensing with examples. 5
- 5 What is a RADAR? Explain its applications. Derive maximum radar range equation. 2+3+5
- 6 Describe any one remote sensing application by highlighting its applications, merits and sensing technology. 10
- 7 What is a Geographic Information System? Explain its benefits. 2+3
- 8 Describe the major representing characteristics of remote sensing images, and the general criterion of the image interpretation. Observe the attached image (Figure 1) and discuss it based on sensing principles and the elements of image interpretation. 3+3+4
- 9 Write short notes on: 3x5=15
  - a. Radiation – Target Interaction
  - b. Geo-stationary orbit
  - c. Remote sensing of Himalayan region

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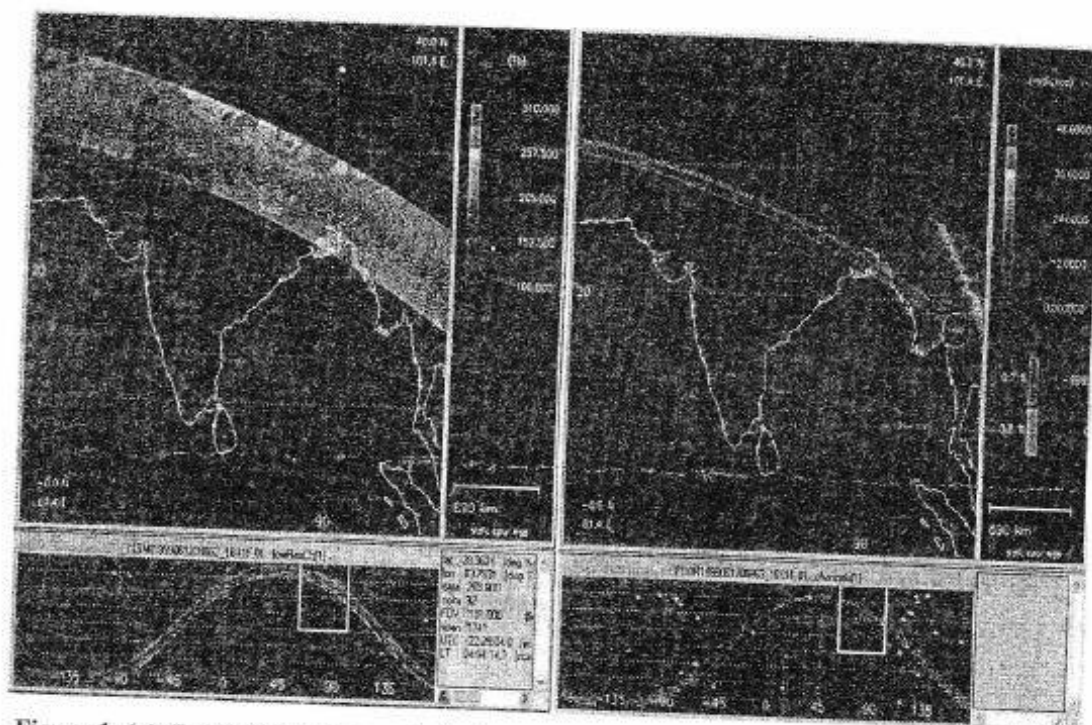


Figure 1. (a) (Left) (Bottom panel) An image projecting the orbital coverage over the globe by a passive sensor (operating at microwave-band) onboard TRMM satellite. (Top panel) Zoomed version of the image indicated by the square at the bottom panel. (b). (Right) same as (a) but for visible band.

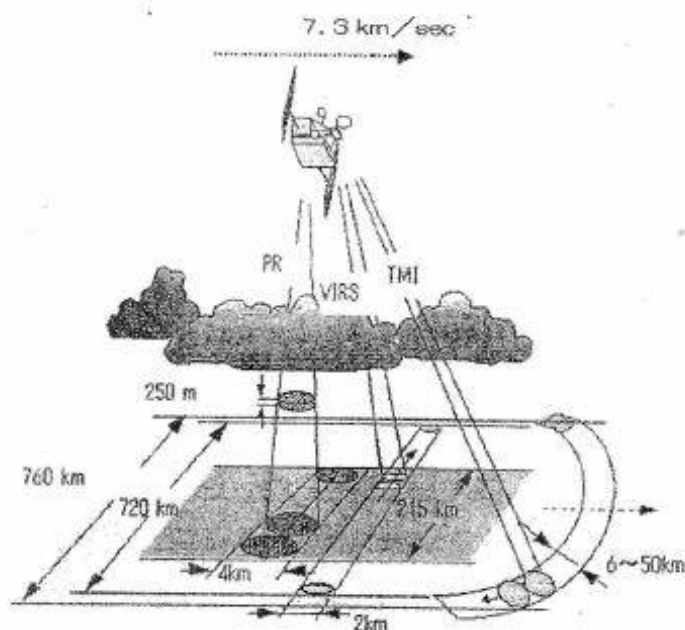
|             |          |            |        |
|-------------|----------|------------|--------|
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**Subject: - Remote Sensing (Elective III) (CT78501)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ **Necessary figure is attached herewith.**
- ✓ Assume suitable data if necessary.

1. Define remote sensing and describe its advantages and classes in different aspects. [3+3+4]
2. Describe in brief about the electromagnetic spectrums that are used for remote sensing process. [7]
3. Explain in detail about the mechanisms of interaction of radiation from energy source with the atmosphere in remote sensing. [8]
4. Describe the basics of passive and active remote sensing with examples. Explain briefly about visible and infrared technique of passive remote sensing. [5+5]
5. Derive an expression for maximum range of a radar system suitable for a point target. [5]
6. With a suitable example describe one of remote sensing applications and highlight its technological and application merits. [10]
7. What is a Geographic Information System? Briefly explain its benefits. [2+3]
8. Describe the major representing characteristics of remote sensing images, and the general criterion of the image interpretation. Observe the attached image and discuss it. [3+3+4]
9. Write short notes on: [3x5]
  - a. Radiation – Target Interaction
  - b. Geo-stationary orbit
  - c. Remote sensing of Himalayan landscape: scopes and limitations

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**Figure 1.** A illustration showing an observation geometry of a set of sensors (PR: precipitation radar, TMI: TRMM microwave imager and VIRS: visible and infrared imager) onboard a satellite called Tropical Rainfall Measuring Mission (TRMM). The satellite revolves along a non-synchronous orbit at the height of 350 km above the Earth surface. The inclination angle and the orbital period are 35° and 90 minutes, respectively.