

DEPARTMENT OF CIVIL, ENVIRONMENTAL AND GEOMATICS ENGINEERING

SGE2164 Remote Sensing I- CAT One

Date 29th /10/2024

YEAR II, SGE-SEM-I

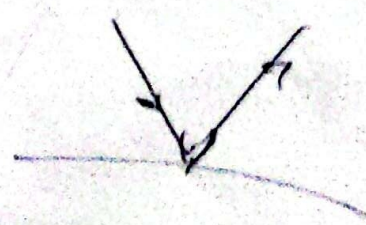
Duration: 3600 Seconds

Instructions:

- 1) Attempt all questions
- 2) Do not forget to write your registration number
- 3) Do not write anything on this question paper
- 4) Respect and follow the question order when answering.
- 5) Any attempt to cheating will be awarded zero mark.

- a) What is remote sensing? /2marks ✓
- b) Explain the difference between Sensors and Platforms in Remote Sensing /2marks ✓
- c) Explain three main Remote Sensing Platforms /5marks ✓
- d) What are advantages and disadvantages of Airborne Remote sensing? /3marks ✓
- e) Explain advantages and disadvantages of Spaceborne Remote sensing? /3marks ✓
- f) Compare and contrast active and passive Remote sensing /2marks ✓
- g) What are advantages and limitations of Remote Sensing? /5 marks ✓
- h) With the aid of well labeled sketch, discuss the main stages of Remote Sensing /4marks ✓
- i) What happen when the Electromagnetic energy interacts with the targets on the surface? /4marks ✓
- j) What do you understand by Spectral Reflectance curve? /2marks ✓
- k) Explain the difference between specular and diffuse reflection. 2marks ✓
- l) What do you understand by Black body in remote sensing? /1mark ✓

Good Luck!





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SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL, ENVIRONMENTAL AND GEOMATICS ENGINEERING

SGE2164 Remote Sensing I- CAT Two

Date 4th /12/2024

YEAR II, SGE-SEM-I

Duration: 1 hour

1) With the aid of well labeled sketches where applicable, explain the following terms as uses in satellite system:

- i. Orbital period [1]
- ii. Satellite altitude [1]
- iii. Apogee and perigee [2]
- iv. Inclination of the satellite /orbit [1]
- v. Nadi, zenith and ground track [3]
- vi. Swath [1]
- vii. Sidelap and overlap [1]

2) Compare and contrast the Geo-synchronous orbit from polar orbit in term of the following:

- i. By definition [1]
- ii. Inclination angle [1]
- iii. Altitude [1]
- iv. Foot prints/earth coverage [1]

3) With examples, explain the following terms used as resolving power in remote sensing:

- i. Spatial Resolution [5] → Size of the smallest feature that can be detected by satellite sensor in Image satellite
- ii. Spectral Resolution [5] → Ability of sensor to define finer wavelengths intervals
- iii. Temporal resolution [5] → Refers to nbr of times an object is sampled or how often data are obtained for the same area.
- iv. Radiometric Resolution [5] → Sensitivity of the sensor to the magnitude of the electromagnetic radiation

4) Explain the advantages and limitations of thermal scanning in remote sensing [3]

5) Radiant exitance energy M, is given by the Stefan Boltzmann law.

- i. What states the Boltzmann law of radiation? [1]
- ii. Write the formula of radiation and label all its variables [2]

Good Luck!



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END OF SEMESTER I EXAMINATION - ACADEMIC YEAR 2024/2025

YEAR: 2 SEMESTER: I PROGRAMME(S): SGE

MODULE: SGE2162 REMOTE SENSING I

DATE: 14/01/2025

TIME: 2 hours

MAXIMUM MARKS = 50

INSTRUCTIONS

1. This paper contains **FOUR (4)** questions.
2. **Answer THREE (3) Questions only:**
Question ONE (1) from Section "A" is Compulsory and Answer any TWO (2) from Section "B"
3. Any written materials and Programmable calculators are NOT allowed.
4. Do not forget to write your Registration Number.
5. Write all your answers in the booklet provided
6. Do not write any answers on this questions paper.
7. **Start each question in a NEW page**

SECTION: A

Question: 1

- a) The first requirement for remote sensing is an energy source which can illuminate a target.
- i. What is the obvious source of electromagnetic energy that you can think of? [2]
 - ii. What "remote sensing device" do you personally use to detect this energy? [2]
 - iii. Assume the speed of light to be 3×10^8 m/s. If the frequency of an electromagnetic wave is 500,000 GHz (GHz = gigahertz = 10^9 m/s), what is the wavelength of that radiation? Express your answer in micrometers (μm). [3]
- b) Most remote sensing systems avoid detecting and recording wavelengths in the ultraviolet and blue portions of the spectrum. Explain why this would be the case. [3]
- c) What advantages do sensors carried on board satellites have over those carried on aircraft? Are there any disadvantages that you can think of? [3]
- d) Suppose you have a digital image which has a radiometric resolution of 6 bits. What is the maximum value of the digital number which could be represented in that image? [2]
- e) If you wanted to map a mountainous region, limiting geometric distortions as much as possible, would you choose a satellite-based or aircraft-based scanning system? Explain why in terms of imaging geometry. [3]
- f) Explain the difference between Sensors and Platforms in Remote Sensing. [2]
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SECTION: B

Question: 2

- a) If an agricultural area, with crops such as wheat and corn, became flooded, what do you think these areas might look like on a radar image? Explain the reasons for your answers based on your knowledge of how radar energy interacts with a target. [4]
- b) Explain why the use of a synthetic aperture radar (SAR) is the only practical option for radar remote sensing from space. [3]
- c) With examples, explain the following terms used as resolving power in remote sensing:
- i. Spatial Resolution. [2]
 - ii. Spectral Resolution. [2]
 - iii. Temporal Resolution. [2]
 - iv. Radiometric Resolution. [2]

Question: 3

- a) One 8-bit pixel takes up one single byte of computer disk space. One kilobyte (Kb) is 1024 bytes. One megabyte (Mb) is 1024 kilobytes. How many megabytes of computer disk space would be required to store an 8-bit Landsat Thematic Mapper (TM) image (7 bands), which is 6000 pixels by 6000 lines in dimension? [2]
- b) Compare and contrast the Geo-synchronous orbit from polar orbit in terms of the following parameters:
- i. By definition. [2]
 - ii. Inclination angle. [2]
 - iii. Altitude. [2]
 - iv. Foot prints/earth coverage. [2]
- c) Differentiate active from passive Remote sensing. [2]

Question: 4 Choose the correct answer(s) for each sub-question

- a) The distinct advantages of remote sensing are: [1.5]
- i. Synoptic view.
 - ii. Global coverage.
 - iii. Repeatability.
 - iv. All of the above. ✓
- b) A perfectly black body. [1.5]
- i. Is a diffuse emitter ✓
 - ii. Absorbs all the radiations of every wave length ✓
 - iii. Emits power of every wave length
 - iv. All the above
- c) Vegetation with more chlorophyll will reflect more: [2]
- i. Ultraviolet energy
 - ii. Emitted energy
 - iii. Near-infrared ✓
 - iv. Thermal infrared
 - v. All the above
- d) A and B are two towers of equal height diametrically opposite on either side of the nadir point, at 3 km and 5 km distances. Which one of the following statements is correct? [2]
- i. Height displacement of A will be less than that of B
 - ii. Height displacement of B will be less than that of A ✓
 - iii. Height displacement of A and B is equal
 - iv. Height displacement of A and B will be towards each other
- e) An image that shows finer details is said to be of: [2]
- i. Finer resolution ✓
 - ii. Coarser resolution
 - iii. Moderate resolution
 - iv. None of the above

f) The spectral region of the electromagnetic radiation which passes through the atmosphere without much attenuation is known as:

[2]

- i. Ozone hole
- ii. Atmospheric window
- iii. Ozone window
- iv. Black hole

g) Generally, purpose of geostationary satellite is:

[2]

- i. Remote Sensing
- ii. Global positioning
- iii. Telecommunication and weather monitoring
- iv. None of the above

h) Which phenomena occurs when particles or large gas molecules present in the atmosphere interact with the electromagnetic radiation and make them to be redirected from its original path?

[2]

- i. Absorption
 - ii. Scattering
 - iii. Both absorption and scattering
 - iv. None of the above
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