Remote Sensing

Division C

Written Exam

Team Name: _____ Team #: ___

Team Members: _____

Score: ___/132

A. Matching (10 points)

___	1. Nadir	a.	Ability to discriminate small differences in energy
___	2. Albedo	b.	Produces black and white images
___	3. Diffraction	c.	Reflectivity of a surface
___	4. Refraction	d.	Describes the area on the Earth's surface represented by a pixel
___	5. Spatial Resolution	e.	Energy is deflected in a single direction
___	6. Temporal Resolution	f.	Point on the ground in line with the RS system and the center of Earth
___	7. Radiometric Resolution	g.	Bending of radiation through a medium
___	8. Panchromatic	h.	Time between two images of the same area
___	9. Specular Reflection	i.	Bending radiation around a corner/boundary
___	10. Diffuse Reflection	j.	Energy is reflected in all directions

B. Identification (10 points)

1. Define the following acronyms:
   a. RADAR
   b. LIDAR
   c. CCD
   d. ASTER
   e. MODIS
2. Fill in the Blank
   a. _____ sensors provide all their own energy for illumination
   b. _____ sensors can only be used when naturally occurring energy is available
   c. _____ scattering is why the sky is blue
   d. _____ scattering occurs when particles are the same size as the wavelength of light
   e. _____ scattering is how fog is detected

C. Calculations and Short Answer. Please show all work for calculations.

1. There are eight bands on the LANDSAT 7 satellite. Identify the common name and range of wavelengths of electromagnetic radiation that each channel uses to create an image:

Channel	Common Name/Type of Radiation (1 pt.)	Wavelength Range (3 pts.)
1		
2		
3		
4		
5		
6		
7		
8		

2. Calculate the frequency of a photon of near infrared light of wavelength 2.5 μm. (3 points)

3. Calculate the energy of a photon of near ultraviolet light of wavelength 320 nm. (3 points)

4. Calculate the total energy emitted by an object per unit surface area per unit time at a temperature of 6000 K and an emissivity of 0.55. (3 points)

5. Calculate the wavelength of peak energy emission for an object at a temperature of 8000 K. (3 points)

6. The A-train is one of the most important satellite constellations. List all the satellites that are active, no longer part of the A-train, or have experienced failure in order of orbit formation*. Include date launched and if active, removed, or failed. Add reason for failure/removal. (20 points)

*If satellite A had failed, but was to orbit 30 minutes before satellite B, list A before B.

D. Multiple Choice. Choose the BEST answer. (10 points)

_____ 1. In aerial photos, the phenomena used to create depth is:
   a. Stereoscopic effect
   b. Parallax effect
   c. Photosynthetic effect
   d. 3D effect

_____ 2. Remote sensing can not measure which of the following?
   a. Ocean floor topography
   b. Water temperature
   c. Wind speed and direction
   d. None of the above

_____ 3. All of the planet's weather takes place in the
   a. Troposphere
   b. Mesosphere
   c. Stratosphere
   d. Ionosphere

_____ 4. Remote Sensing unofficially started in _____ when pictures were taken from hot air balloons
   a. United States
   b. France
   c. England
   d. China

_____ 5. Which of the following is not monitoring the atmosphere as part of EOS?
   a. ICESat
   b. Terra
   c. ROCSat
   d. SORCE

_____ 6. If a satellite-based pushbroom sensor has a row of 5,000 CCD cells aligned perpendicular to the satellite's motion, and the swath width is 600 kilometers, what is the ground sampling distance (spatial resolution) in meters?
   a. 120 kilometers
   b. 30 meters
   c. 120 meters
   d. 1.2 meters

_____ 7. If a satellite is in a polar, sun-synchronous orbit at an altitude of 705 kilometers, how many minutes and/or seconds of its orbital ground track would be covered by a square image area covering 400 km x 400 km?
   a. 40 seconds
   b. 1 minute
   c. 1 minute and 20 seconds
   d. 1 minute and 30 seconds

_____ 8. Glaciers need fresh snow to survive because the snow
   a. Feeds them with fresh ice
   b. Provides a protective shield against the sunlight
   c. Insulates them from the warmer air
   d. All of the above
   e. None of the above

_____ 9. The size and number of detector elements in a CCD determine the device's:
   a. Wavelength
   b. Frequency
   c. Resolution
   d. All of the above

_____ 10. Which of the following radiations can not be used for Remote Sensing?
   a. Ultraviolet
   b. Visible
   c. Infrared
   d. Microwave

E. Imagery (38 points) *Note: If the question asks for area, please show work.

Figure 1:

1. What year do you think this image was taken?

2. Knowing that the lines represent the terminus location of the Jakobshavn Glacier, what can you definitely say about the rate of change in size of the glacier over time?

3. What type of body of water is in the top left of this image? What are the white chunks?

4. What type of image is this? What bands would be used to create this image in a LANDSAT ETM+?

Figure 2:

1. What is the approximate area of this image in square kilometers?

2. What is the approximate distance between Mounds View High School and Capitol Furniture Sales in meters?

3. What type of image is this? In what season was this image most likely taken?

Figure 3:

1. What is NDVI? Explain.

2. What is the area of the bottom image in square miles? In square kilometers?

3. What problem caused by hurricanes was the principal cause of the increase in water levels immediately before, during, and after the hurricane?

4. If the bottom image is a LANDSAT image and white areas show healthy vegetation, what band is most likely being used? How do you know?

5. What damage do you think the hurricane caused on the Louisiana coast, as shown by the top two images? Describe with appropriate ecological terms.

Figure 4:

1. Why is the river differently colored than the ocean water?

2. How would the color of the river be related to the recent passing of Hurricane Irene?

3. Why is the color of the water in the bay (upper right) different than the color of the water farther out to sea?

4. This image was taken from the MODIS sensor. On what satellite(s) is MODIS attached?