REMOTE SENSING (C) TEST

SOUTHLAND INVITATIONAL TOURNAMENT 2012

Do NOT write on this test.
Use the provided answer sheet.

100 points possible
1st tiebreaker: Marked Questions
2nd tiebreaker: Time

SECTION I
General Knowledge – Multiple Choice – 20 points possible (divided by two for final score = 10 points)

For the first question in this section, select all answers that apply. For subsequent questions, select only the best answer.

1. (Tiebreaker 1, 6 points) Which of the following actions is an example of remote sensing?
    a) The Hubble Space Telescope takes a picture of a distant nebula and scientists use it to gain information about stellar evolution.
    b) A satellite equipped with RADAR gathers information to be used on tonight's weather report.
    c) After clicking a button on a remote control, a man watches a cooking program on his television while sitting on his couch.
    d) A dentist examines an X-ray of her patient's teeth.
    e) The FBI uses footage from a security camera to track a suspect.

2. (2 points) Which of the following types of radiation cannot be used by typical remote sensors?
    a) Radio
    b) Infrared
    c) Green light
    d) Blue light
    e) Gamma

3. (2 points) Energy emitted at a wavelength of 550 nm is what type of radiation?
    a) Radio
    b) Infrared
    c) Green light
    d) Blue light
    e) Gamma

4. (2 points) Which type of radiation is utilized by RADAR?
    a) Radio
    b) Infrared
    c) Green light
    d) Blue light
    e) Gamma

5. (2 points) A passive sensor detects light reflected or transmitted from which of the following sources?
    a) The sun
    b) Cities (i.e. electric lights, etc.)
    c) Itself
    d) (a) and (b)
    e) All of the above

6. (2 points) Which is not an instrument used in remote sensing?
    a) TM
    b) ETM+
    c) HM
    d) MSS
    e) RAR

7. (2 points) The A-Train is a system of satellites in what type of orbit?
    a) Sun-synchronous
    b) Geosynchronous
    c) Geostationary
    d) High Earth
    e) The A-Train is no longer in orbit

8. (2 points) What is the name of the Landsat series satellite to be launched in 2013?
    a) Landsat 8
    b) Landsat 9
    c) LSS (Landsat Science Satellite)
    d) LDCM (Landsat Data Continuity Mission)
    e) There is no Landsat satellite intended for launch in 2013

SECTION II

History – Timeline – 45 points possible (divided by three for final score = 15 points)

Place the following events in remote sensing history on the timeline (second page) of your answer sheet. Not all of the lines will be used. (3 points each. Partial credit will be awarded for reasonably close estimates.)

9: Landsat 5 makes 125,000th orbit of Earth
10: Landsat 3 is launched
11: Landsat 1 is launched
12: NASA begins the TIROS series of satellites
13: Landsat 5 is launched
14: SeaWiFS is launched
15: Landsat 5 acquires MSS data for the first time in over a decade
16: Landsat 2 is launched
17: MODIS is launched on Aqua (it was first launched on Terra)
18: Landsat 7 is launched
19: TM is launched on Landsat 4
20: NASA begins the Nimbus series of satellites
21: Sputnik 1 is launched
22: Sputnik's orbit decays
23: Landsat 6 fails at launch

SECTION III

Acronyms – 10 points possible

In the space provided, write out the full name for each of the following acronyms (1 point each)

24: RADAR
25: LIDAR
26: SONAR
27: MODIS
28: CALIPSO
29: GOES
30: GRACE
31: SeaWiFS
32: LASER
33: TRMM

SECTION IV

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Vocabulary – 15 points possible

In the space provided, write the appropriate term to match each provided definition (1 point each)

34: The gathering of information about an object without being in contact with it
35: An orbit where a satellite returns to the same point at the same time each day
36: An orbit where a satellite passes over a certain latitude at the same time each day
37: An orbit where a satellite is fixed in place over a certain point on Earth
38: The area covered by (or "swept out by") a satellite as it orbits over Earth
39: The frequency with which a satellite flies over a point on Earth
40: The size of a pixel in an image collected by a sensor
41: A sensor which emits energy and records images of that energy reflected back to itself
42: A measure of how much light an object reflects
43: The proportion to which an object is resized for ease of interpretation
44: The process of water through the environment
45: The continuum of energy that travels at the speed of light
46: The amount of intensities a sensor is able to distinguish (its sensitivity)
47: Can be calculated as (Near Infrared-Red)/(Near Infrared+Red)
48: Describes the wavelengths a sensor is able to distinguish

SECTION V

Image Interpretation – 30 points possible

For this section, refer to the separate image sheets

IMAGE A (8 points)

49: (1 point) Which image was taken the day after the levee breach?

50: (1 point) What do the white regions in the lower right and upper left of the left image represent?

51: (3 points) Calculate the area of the left image (in miles)

52: (3 points) These images were taken using the second, fourth, and seventh bands of the thematic mapper on Landsat 5. What wavelengths correspond to these bands?

IMAGE B (4 points)

53: (2 points) What event do these images focus on?

54: (2 points) Why is the city a different color in the right image?

IMAGE C (9 points)

55: (2 points) What color represents bare ground in this image?

56: (2 points) Why are some areas a blue-green color?

57: (5 points) This ecosystem is under environmental stress. Explain what may be causing this problem and why regulations for conservation are somewhat ineffective.

IMAGE D (5 points)

58: (5 points) What is the area of Cyprus (in miles)?

IMAGE E (4 points)

59: (1 point) Is this a true-color or false-color image?

60: (3 points) Why is Niau a different color than the other islands/atolls?

SECTION VI

Calculations – 20 points possible

61: (19 points) The following is hypothetical data from the MODIS sensor. Calculate NDVI, EVI, and show your work, including equations.

Band	Bandwidth	Reflectance
1	620-670 nm	0.16
2	841-876 nm	0.37
3	459-479 nm	0.11
4	545-565 nm	0.08
5	1230-1250 nm	0.37
6	1628-1652 nm	0.52
7	2105-2155 nm	0.54

Use the following constants in your calculations:

$C_1 = 6$

$C_2 = 7.5$

$G = 2.5$

$L = 1$

62: (1 point) Which result is likely to be the most accurate, NDVI or EVI?