Remote Sensing Test Key

A. Matching (10 points)
   1. F
   2. C
   3. I
   4. G
   5. D
   6. H
   7. A
   8. B
   9. E
   10. J

B. Identification (10 points)
   1. Acronyms
      a. Radio detection and ranging
      b. Light detection and ranging
      c. Charged Coupled Detector
      d. Advanced Spaceborne Thermal Emission and Reflection Radiometer
      e. Moderate resolution Imaging Spectroradiometer
   2. Fill in the blank
      a. Active
      b. Passive
      c. Rayleigh
      d. Mie
      e. Non-selective

C. Calculations, Short Answer
   1. Give 1 point for correct type of radiation, 1 point for correct starting wavelength, 1 point for correct ending wavelength, and 1 point for correct units. It's ok to substitute IR for infrared (32 points)
      1. Blue, 0.45-0.52 µm
      2. Green, 0.52-0.60 µm
      3. Red, 0.63-0.69 µm
      4. Near Infrared, 0.76-0.90 µm
      5. Shortwave Infrared, 1.55-1.75 µm
      6. Thermal Infrared, 10.40-12.50 µm
      7. Shortwave Infrared, 2.08-2.35 µm
      8. Panchromatic, 0.52-0.90 µm

   2-5. One point for work shown, one point for correct answer, one point for correct units (12 points)
      2. Work: Application of Velocity=Wavelength * Frequency equation
         Answer: 1.2×10^{14} Hz or 120 THz
      3. Work: Application of V=Wavelength * Freq and Energy=Planck's constant * Frequency

Answer: ≈6.212 x 10^{-19} J

4. Work: Application of Stefan-Boltzmann Equation ($q=\varepsilon*\sigma*T^4*A$)
   Answer: q=40062211.2 W *This is a tiebreak question
5. Work: Application of $\lambda_{max}=b/T$ (b=2.8977685 x 10^{-3} meter-Kelvin)
   Answer: ≈ 3. 622 x 10^{-7} m or 362.2 nm

6. Answer should follow this order exactly (20 points)

OCO (Orbiting Carbon Observatory): Failure due to vehicle launch failure, 2/24/2009 Aqua: Active, 5/4/2002 CloudSat: Active, 4/28/2006 CALIPSO: Active, 4/28/2006 PARASOL: Removed to lower orbit, 12/2/2009 Glory: Failure due to vehicle launch failure, 3/4/11 Aura: Active, 7/15/2004 *This is a tiebreak question. If everything is answered correctly, award 21 points (so one bonus point). Also, if satellites are out of order, subtract one point.

D. Multiple Choice (10 points)
   1. A
   2. D
   3. A
   4. B
   5. C
   6. C
   7. B (Tiebreak question)
   8. D
   9. C
   10. A

E. Imagery (38 points)

   Figure 1:

   1. 2001 (1 point)
   2. Decreasing (1 point) at increasing rate (1 point)
   3. Fjord (1 point); Ice or Iceberg (1 point)
   4. True Color (1 point); ETM+ 1, 2, 3 (3 points)

Figure 2:

1. 1.8 km^2 ± 0.1 km^2 (1 point for work, 1 point for answer, 1 point for units) *Note: I haven't actually tried calculating the area by hand. If you're finding a wider range of answers, you could widen the range if you so choose to.
2. 442.268 m ± 12 m (1 point for work, 1 point for answer, 1 point for units) *Note: I have actually done this by hand, and calculated a distance of 436.6, so I think this range is fair. Still, it is up to the event supervisor's discretion to decide what a fair range is.
3. True color (1 point); Late fall or early winter (1 point)

Figure 3:

1. Normalized Differentiated Vegetation Index (1 point); Definition along the lines of: Used to describe various land types, usually to determine whether or not the image contains vegetation (1 point); Equation: $NDVI = \frac{NIR-VIS}{NIR+VIS}$ (1 point)
2. (1 point for work, 1 point for answer, 1 point for correct units for each calculation, so 6 points total from this question) Square miles: 5500 mi^2 ± 100 mi^2; Square kilometers: 8700 km^2 ± 160 km^2 *Again, range is to be determined by the discretion of the event supervisor. These ranges are based on my own calculations of the area
3. Storm surge (1 point)
4. ETM+ Band 8 (1 point) Panchromatic (1 point); Explanation along the lines that image is majority black and white (1 point)
5. Destruction of wetlands (1 point) and barrier islands (1 point) *This is a tiebreaker question

Figure 4:

1. Explanation along the lines of sediment lying in the river (1 point) and that the ocean is deep, and thus blue (1 point)
2. Explanation along the lines of destruction and extreme erosion (1 point)
3. Explanation along the lines of sediment flowing from river is making the bay water lighter (1 point)
4. Terra (1 point) Aqua (1 point)