**CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS**

**E4 - ADVANCED REMOTE SENSING** **October 2013**

**Note: This examination consists of 10 questions on 2 pages.**

Time: 3 hours

| Q. No | | Marks Value | Earned |
|---|---|---|---|
| 1 | Remote sensing encompasses a wide range of spectral regions. For identifying geological materials at the surface, which ranges are most important and why (i.e. what rock and mineral characteristics are recorded in these ranges)? | 10 | |
| 2 | Images are received with a digital number (DN; also called Grey Level or Brightness Value) in each pixel. What physical quantity does that number represent and how would it be converted to top-of-atmosphere (TOA) reflectance? Include a statement of what information would be needed to complete this conversion and where it would be acquired. | 10 | |
| 3 | What would be an appropriate resolution of DEM for performing an orthorectification on each of the following? Provide an overall statement of the principles used to arrive at an answer.<br>a) a Landsat ETM+ image<br>b) an IKONOS image<br>c) a MODIS image | 10 | |
| 4 | Define active and passive sensors. List at least two advantages and two disadvantages of each form. Include an example of each among existing sensors whose imagery is readily available. | 10 | |
| 5 | When using LiDAR data, explain what is meant by the terms “first return,” “last return” and “intensity.” Outline how LiDAR can be used in one common applications area of your choice (applications area examples: forestry, urban planning, etc.). | 10 | |
| 6 | Image processing may involve per-pixel operations and neighbourhood operations. Define each and name one example of a common operation in each of these categories. | 10 | |
| 7 | High temporal resolution imagery is becoming more important for examining both natural cycles and directional change on the Earth’s surface. In detecting changes to the built environment of a city, what would be the prime considerations for choosing, acquiring and pre-processing appropriate images? | 10 | |
| 8 | How does the geometry of a radar (SAR) image differ from the geometry of passive aerial or satellite imagery? What difficulties does this present – or what problems might it solve (answer either difficulties or solutions; it is not necessary to answer both). | 10 | |
| 9 | Thermal imagery was retained among the new Landsat 8 products to provide information related to agricultural irrigation and other water uses in semi-arid areas. Explain how thermal imagery would be used in this application. Demonstrate in the answer that you understand basic principles of thermal data. | 10 | |

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| 10 | Hyperspectral data contains many correlated bands, which creates inefficiencies and statistical difficulties in many procedures. For an application of your choice (for example crop stress identification or gold prospecting), describe an effective way to select the most appropriate bands for use in a classification exercise. | 10 | |
| | | 100 | 0 |