

ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2014 SESSION

Open-book examination  
Calculators : only authorized models  
Duration : 3 hours

14-GM-A4 PHOTOGRAMMETRY

**QUESTION 1 (20 POINTS)**

Considering the following data

- digital camera, image size : 14 430 pixels cross track,  
9 420 pixels along track
- focal length : 100,5 mm
- pixel size (ground level, GSD) : 0,1 m
- physical pixel size : 7,2  $\mu\text{m}$
- forward overlap : 60 %
- sidelap : 40 %
- mean terrain height : 100 m
- area to be mapped : 1,5 km by 15 km

Calculate:

- a) image scale (4 points)
- b) area covered on the ground with one image (4 points)
- c) flying height (4 points)
- d) number of flight lines (4 points)
- e) total number of images needed to cover the area (4 points)

**QUESTION 2 (20 POINTS)**

Explain how to verify if the vertical accuracy of a photogrammetric product (ex.: a digital terrain model) meets an accuracy standard at a 95 % confidence level.

### **QUESTION 3 (15 POINTS)**

Unmanned Aerial Vehicles (UAV) are increasingly used to close the gap between terrestrial and conventional aerial photogrammetric applications. What are the challenges facing photogrammetrists and manufacturers in order to produce mapping-grade products?

### **QUESTION 4 (15 POINTS)**

Give some factors that can explain height differences derived from two LiDAR Swaths in overlapping areas. Explain your answer.

### **QUESTION 5 (15 POINTS)**

To estimate the cost of any photogrammetric project, some general common costs must be taken into account. What are they? Give some details about them.

### **QUESTION 6 (15 POINTS)**

Explain how the collinearity equation can be used to perform simultaneously the relative and absolute orientation of a stereoscopic model.