CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS

SCHEDULE I / ITEM 4 **March 2007**
REMOTE SENSING & APPLIED PHOTOGRAMMETRY

Examination Results for Candidate No.:

Q. No	Time: 3 hours	Marks Value	Marks Earned
1	Briefly explain the following terms together with the factors that control them for a given digital imaging system: a) Ground Sampling Distance (GSD), b) Radiometric resolution, and c) Spectral resolution.	9	
2	a) Explain why active microwave systems are more suited for high resolution remote sensing when compared to passive microwave systems. b) You have a digital B/W (8 bits/pixel) and a color (24 bits/pixel) image. Comment on the radiometric and spectral resolutions of these images (i.e., which one has higher radiometric and spectral resolution) c) Define the resolving power of an imaging system. List the factors that affect the resolving power of a digital imaging system.	2 3 3	
3	a) Explain how can you use the spectral reflectance curve to identify the moisture content in vegetation and soil? b) Most remote sensing systems avoid detecting and recording wavelengths in the Ultraviolet and blue portions of the spectrum. Explain the rationale behind this practice. c) Do we need Fiducial marks for metric digital cameras? Why?	3 3 3	
4	a) Briefly explain the following terms: (i) Registration, (ii) geo-coding, and (iii) ortho-rectification. b) What are the main characteristics/differences between supervised and unsupervised classification strategies? Tabulate your answer.	6 5	

5	A vertical photograph made at a flight height of 2000′ above sea level shows a radio tower with a base elevation 540′ above the same datum. The image of the tower has a relief displacement of 1.33". The distance from the photograph's principal point to the top of the tower is 5.97". What is the height of the tower?	7	
6	The following is a 3x3 sub-image of a remote sensing scene: 112 96 94 86 37 106 120 87 66 Derive the smoothed value at the central pixel using the following filters: a) 3x3 moving average, b) 3x3 median filter, and c) the following smoothing mask $\frac{1}{14}\begin{bmatrix}1 & 1 & 1\\ 1 & 6 & 1\\ 1 & 1 & 1\end{bmatrix}$	6	
7	An aerial camera with IMC (Image Motion Compensation) is used to acquire photography at a flying height of 5000 m above ground. The focal length is 152.15 mm. The aircraft is flying at a speed of 300 km/hr and an exposure time of 1/300 second is used. How far across the focal plane must film travel during the exposure in order to obtain an image with no image motion blurring?	7	
8	A distance between 2 points on a map at a scale of 1:62,000 is 28.65 mm. The distance between the same points on a vertical photo taken with a 151.11 mm focal length camera is 47.19 mm. If both points lie at an elevation of 86 metres, compute the flying height above datum.	7	
9	a) In a photogrammetric procedure that exploits the collinearity model, list possible unknown parameters that can be involved. b) In a photogrammetric procedure that exploits the collinearity model, list possible observables that can be involved. Quote an example on how each quantity can be observed. c) What are the parameters that are solved for in the following photogrammetric problems: (i) Single photo resection, (ii) Photogrammetric intersection, (iii) Bundle adjustment, and (iv) Bundle adjustment with self-calibration?	4 6 8	

10	a) Classify and describe the types of points based on their role in a photogrammetric bundle adjustment procedure. b) Classify and describe the types of points based on their appearance in photogrammetric images.	2 2	
11	You are given a stereo-pair with identified twenty-four tie points. List the balance between the observables and the unknown parameters in a bundle adjustment procedure to solve for the exterior orientation parameters as well as the ground coordinates of tie points. Can you estimate the involved unknown parameters? Why?	6	
12	a) What is the difference between establishing the exterior orientation and the relative orientation of a stereo-pair? b) Do we need ground control points to establish the relative orientation of a stereo-pair? Why? c) How would you evaluate the precision and the accuracy of the outcome from a photogrammetric bundle adjustment procedure?	2 2 4	
	Total Marks:	100	