ASSOCIATION OF CANADA LANDS SURVEYORS - BOARD OF EXAMINERS
WESTERN CANADIAN BOARD OF EXAMINERS FOR LAND SURVEYORS
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS

SCHEDULE I / ITEM 4 **March 2003**

REMOTE SENSING & APPLIED PHOTOGRAMMETRY

Note: This examination consists of 12 questions on 2 pages. **Marks**

Q. No	Time: 3 hours	Value	Earned
1	Briefly explain the following terms: a) Atmospheric window b) Spectral Reflectance c) Spatial resolution d) SLAR e) False-color composite f) Image enhancement g) Radiometric calibration	10	
2	a) What is a low pass filter used for? b) What is a principal component analysis (PCA) used for? c) Explain the main differences between the TM sensor on the LANDSAT and the HRV sensor onboard the SPOT satellite.	10	
3	The following is a sample of a remote sensing image: 7 7 10 5 7 6 4 4 5 What is the smoothed value at the central point using the following filters:? a) Mean b) Median c) The following smoothing mask 1 1 1 1 2 1 1 1 1	5	
4	What are the factors involved in remote sensing image acquisition that affect the image geometry?	5	
5	In the context of image classification, explain the difference between testing and training data. Why do we need them both? How do we interpret the accuracy assessments?	10	
6	a) How can the normalized difference vegetation index (NDVI) be used to monitor the evolution of a growing crop from soil reflectance to vegetation reflectance? b) Compare and contrast the NDVI and the PVI	10	

7	A vertical photograph was taken with a 152.4-mm focal length camera over an area whose elevation ranges between 300 m and 600 m. The smallest scale requested for the project is 1:20000. How high above mean sea level must the aircraft fly to meet this scale requirement and what will be the largest scale in the project?	5	
8	The distances to the 7.5 degree and 15 degree collimators, measured from the center collimator along a diagonal out to the corner of the photographic plate during the calibration process, are 20.22 and 41.177 mm respectively. Compute the focal length based on the distance to the 7.5 degree collimator and compute the radial distortion at the 15 degree collimator.	10	
9	a) A pair of overlapping vertical photos was taken at a flying height (H) of 1200 m above mean sea level with a focal length of 152.4 mm. The air base (B) was 400 m. Using the Parallax (P) equations, estimate the elevation of point (A) whose image coordinate in the stereo pairs are: $(x_\ell, y_\ell) = (53, 50.8)$ mm and $(x_r, y_r) = (-38, 50.9)$ mm b) In the computation of the elevation of point (A) in the previous question, suppose that the random errors were ± 2 m in H, ± 2 m in B, ± 0.1 mm in P_a. Compute the resulting error in the elevation of the point due to the presence of these errors.	10	
10	a) The images of the top and bottom of a utility pole are 130 mm and 125 mm, respectively from the principal point of a vertical photograph. What is the height of the pole if the flying height above the base of the pole is 875m? b) Assume in part (a) that the accuracy of each measured photo distance is 0.1 mm and that the accuracy of the flying height is 2 m. What is the expected accuracy of the computed height of the utility pole?	10	
11	a) Aerial Photography is to be taken from a flying height of 2000m above ground with a camera having a 152 mm focal length and a 23x23 cm format. What is the ground coverage area covered by a single photo and by a stereoscopic model (assume overlap of 60%)? b) An aerial camera with forward-motion compensation and a 152.4 mm focal length is carried in an airplane traveling at 250 km/hr. If the flying height is 3400 m and if the exposure time is 1/500 sec, what distance (in millimeters) must the film be moved across the focal plane during exposure in order to obtain a clear image?	10	
12	Elaborate on what role onboard navigation sensors (such as GPS and Inertial Navigation Systems) can play in aerial photogrammetry.	5	
	Total Marks:	100	0