## CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS

## C-7 REMOTE SENSING & PHOTOGRAMMETRY

October 2014

Although programmable calculators may be used, candidates must show all formulae used, the substitution of values into them, and any intermediate values to 2 more significant figures than warranted for the answer. Otherwise, full marks may not be awarded even though the answer is numerically correct.

Note:	This examination consists of twelve questions on two pages.	Mai	r <u>ks</u>
<u>Q. No</u>	Time: 3 hours	Value	Earned
	a) What is the conceptual basis of the photogrammetric Coplanarity condition?	2	
	b) What is the conceptual basis of the photogrammetric Collinearity equations?	2	
1.	c) Give a brief definition of the following entities: Nadir point, principal point,	3	
	principal distance, focal length, principal planes, as well as optical axis of a		
	lens system.		
	a) What are the alternative methodologies for deriving the Interior Orientation	2	
	Parameters (IOP) of a photogrammetric camera?		
2.	b) Classify and describe the types of points based on their role in a	2	
	photogrammetric bundle adjustment procedure.		
	c) Explain why active microwave systems are more suited for high resolution	2	
	remote sensing when compared to passive microwave systems.		
	d) What is the EM radiation waveband used in LiDAR systems? Are they active	2	
	or passive systems?		
	a) What is meant by accuracy and precision?	2	
	b) What are the factors affecting the precision of the outcome from a	2	
	photogrammetric bundle adjustment procedure?		
3.	c) What are the factors affecting the accuracy of the outcome from a	2	
	photogrammetric bundle adjustment procedure?		
	d) How would you evaluate the precision and the accuracy of the outcome from a	2	
	photogrammetric bundle adjustment procedure?		
	a) What are the advantages of RADAR remote sensing systems?	2	
4	b) Briefly explain the following terms together with the factors that control them	8	
4.	for a given digital imaging system: 1) Radiometric resolution, 2) Spectral		
	resolution, 3) Geometric resolution, and 4) Temporal resolution.		
	a) Explain how you can use the spectral reflectance curve to identify the moisture	2	
5.	content in vegetation and soil.		
	b) What are the main characteristics of a metric camera?	2	
	a) What are the key information items you expect to have in a camera calibration	2	
	certificate for a metric digital camera?		
	a) What is the maximum number of independent rotation angles needed to define	2	
	a three-dimensional rotation matrix? Why?	_	
6.	b) What are the parameters that are solved for in the following photogrammetric	6	
	problems: 1) Single photo resection, 2) Photogrammetric intersection, 3)		
	Bundle adjustment, and 4) Bundle adjustment with self-calibration?		
	a) Briefly explain the following terms: 1) Registration, 2) Geo-coding, and 3)	4	
7.	Ortho-rectification.		
/.	b) What are the main characteristics/differences between supervised and	4	
	unsupervised classification strategies? Tabulate your answer.		

<ul> <li>a) Aerial images have varying scale. Use a sketch to il special case where the scale in a photograph is const bill or intervention between the images of a stereo-pair? WI</li> <li>c) How many ground control points are needed to esta orientation of a 3D model? Why?</li> <li>a) List the required input and necessary steps for gene differential rectification.</li> <li>b) Describe the conceptual basis of image smoothing if frequency domain.</li> <li>d) What are the main differences between the scene frame and line cameras?</li> <li>a) What are the alternative methodologies for establish parameters of an imaging system? What is the objet adjustment procedure involving an image block witt points? How are the image coordinate systems defind photograph acquired by an analogue digital image acquired by a digital metric camera?</li> <li>a) You have a digital B/W (8 bits/pixel) and a color (2 Comment on the radiometric and spectral resolution which one has higher radiometric and which one has resolution).</li> <li>b) What are the quantities measured by a GPS/INS system platform? What are the main requirements for relative the exterior orientation parameters of the exposure of the ex</li></ul>	dered constant.2blish the relative2y?2blish the absolute2ating an orthophoto using4a the frequency domain.2enhancement) in the2acquisition procedures for2ing the exterior orientation4tive of a bundle3argound control and tie3add in: 1) an analogue3	
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balance between the observables and the unknown		
adjustment procedure to solve for the exterior orien	*	
the ground coordinates of tie points. Can you estimate	the involved unknown	
12. parameters? Why?		
b) A distance between 2 points on a map at a scale of	I	
distance between the same points on a vertical phot		
focal length camera is 41.19 mm. If both points lie	taken with a 152.24 mm	
meters, compute the flying height above datum.	taken with a 152.24 mm	
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