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SCHEDULE I / ITEM 4
October 2004
REMOTE SENSING & APPLIED PHOTOGRAMMETRY

Note: This examination consists of 11 questions on 2 pages.

Q. No	Time: 3 hours	Value	Earned

1	Briefly explain the following terms:
	  a) Active Sensor
	  b) Spectral Reflectance
	  c) Spatial resolution
	  d) SLAR
	  e) LIDAR
	  f) Image enhancement
	  g) Radiometric calibration
		14	

2	What are the factors involved in remote sensing image acquisition that affect the image geometry?	4	
3	a) What is a high 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.	3 3 4	

4	a) Briefly explain the following terms:
	  • Registration
	  • Rectification
	  • Geocoding
	  • Orthorectification
	
	b) Briefly describe the necessary steps and needed information for rectifying a SPOT image.
		4
		
		6	

5	a) What are the major steps for the thematic classification of satellite imagery? b) What is the meaning of *training the classifier*? c) What are the major differences between *supervised and unsupervised training of the classifiers*? d) What is the main difference between parametric and nonparametric thematic classification of remote sensing data?	3 3 3 3	

The "Marks" heading appears above the Value and Earned columns.

6	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
		6	

7	(a) A pushbroom (linear) digital camera has 1000 array of CCD elements at a pixel size of 10 µm x 10 µm. The nominal focal length of the camera is 25 mm. What is the field of view for this camera? What will be the pixel size on the ground if the flying height is 1000m? (b) For a particular photograph, the measured x and y fiducial distances were 233.2 and 233.7 mm. The corresponding x and y-calibrated distances were 232.408 and 232.852 mm, respectively. Compute the corrected values for a point with photo coordinates of x = 102.9 mm and y = -92.1 mm.	5 5	
8	The ground distance of a straight boundary of a cornfield is 550 m. The field is nearly level and lies beside the principal point of the photo. The distance on the photo of this boundary is 5.15 cm. a) What is the scale of the photograph? b) Express this scale in unit equivalents in centimetre per kilometre. c) If the focal length of the camera used to take the photograph is 152 mm, how high was the aircraft above the ground when taking the photograph?	2 3 3	
9	What are the theoretical minimum numbers and types of control points required for the absolute orientation of aerial stereo pairs? Explain your answer. What considerations are relevant to the placement of these control points? Use diagrams to illustrate your answer.	8	
10	How many 1:10,000 aerial photographs would be required to give a complete stereo coverage of a rectangular project area 15 km long by 20 km wide? For this project, you are using a standard aerial camera with a focal length of 152 mm and a 230 by 230 mm format. The forward overlap is specified as 60% and the sidelap is specified as 30%.	8	
11	a) Briefly describe the principle of the Analytical Bundle Adjustment method (i.e. what is the mathematical model being used, known and unknown quantities, etc.) b) Briefly describe the benefits of the Global Positioning System (GPS) and Inertial Navigation Systems (INS) to aerial-triangulation.	5 5	
	Total Marks:	100	