

## Example / Study Questions for Exam 2

*The following questions are from a recent exam and should give you a good idea of the nature and format of questions, as well as a good sample of the concepts that will be covered on the exam. Note, however, that the exam will have new and different questions, so preparation for it should be more than finding the answers to these particular questions. But, many of the questions will be related to these questions, so likely good to be familiar with the concepts in them.*

1. A digital number (DN) in a digital image acquired by a multispectral scanner is a composite signal of
  - a. terrain radiance
  - b. atmospheric and illumination effects
  - c. sensor and platform effects
  - d. all of the above
  
2. Digital number, brightness value, radiance and reflectance are all related and measures of
  - a. temporal resolution
  - b. radiometric response
  - c. spectral wavelengths
  - d. spatial resolution
  - e. all of the above
  
3. To produce images with the highest spatial resolution would you choose?
  - a. a multispectral scanner
  - b. a linear array (pushbroom) system
  - c. a thermal infrared scanner
  - d. synthetic aperture radar
  
4. Which item does NOT belong to the following related terms?
  - a. IFOV
  - b. wavelength
  - c. ground resolution cell
  - d. spatial resolution
  - e. pixel
  
5. Multispectral scanners operating in the range of 0.4 - 2.5 micrometers detect, measure and record variations in
  - a. radiant temperatures of surface features
  - b. spectral reflectance of surface features
  - c. spectral-radiometric and spatial characteristics of energy reflected by surface features
  - d. all of the above
  
6. In contrast to film, electro-optical sensing systems are capable of
  - a. measurements of longer wavelengths
  - b. higher radiometric sensitivity and resolution
  - c. electronic communication of data to the ground
  - d. a, b and c
  
7. A digital image can have which of the following components or dimensions?
  - a. spatial
  - b. spatial and spectral
  - c. spatial, spectral, and radiometric
  - d. spatial, spectral, radiometric and temporal
  
8. The instantaneous field of view (IFOV) of the Landsat TM reflective bands is
  - a. 10 meters
  - b. 20 meters
  - c. 30 meters
  - d. 80 meters

9. Landsat data provide (if classified) a historical record of land cover beginning in
  - a. 1962
  - b. 1972
  - c. 1982
  - d. 1992
10. Digital numbers for Landsat TM and SPOT data
  - a. are subject to geometric errors
  - b. range from 0 to 255
  - c. are relative values proportional to surface radiance
  - d. all of the above
11. With its off-nadir viewing capability (enabling more frequent data acquisition) and high spatial resolution, SPOT data are well suited for
  - a. regional to global scale projects
  - b. land cover classification of county-sized areas
  - c. monitoring soil moisture profiles of crop fields
  - d. all of the above
12. Imagery from which of the following sensors will have the smallest proportion of mixed pixels?
  - a. SPOT panchromatic
  - b. SPOT multispectral
  - c. Landsat TM
  - d. Landsat ETM+
  - e. AVHRR
13. Compared to Landsat and SPOT data, the major advantage(s) of AVHRR data for land remote sensing is/are
  - a. its temporal frequency and large area coverage
  - b. its radiometric and spatial resolutions
  - c. its multispectral bands, especially in the visible and near infrared
  - d. all of the above
14. Temporal profiles of the NDVI can be used to good advantage for
  - a. land cover classification
  - b. monitoring vegetation development and condition
  - c. evaluating effects of drought or other vegetation stresses
  - d. all of the above
15. Advantages of aerial digital camera systems and data compared to Landsat TM data are
  - a. flexible scheduling; more frequent, timely data acquisition possible
  - b. higher spatial resolution
  - c. lower cost per square mile of coverage
  - d. wide area coverage
  - e. a and b
16. Which of the following materials is commonly used for making detectors sensitive to visible and near infrared radiation?
  - a. silicon
  - b. lead sulfide
  - c. indium antimonide
  - d. barium sulphate
17. The major kinds of errors associated with the DN's of digital multispectral imagery are
  - a. geometric and radiometric
  - b. spectral and temporal
  - c. absolute and relative
  - d. a and b
  - e. a, b and c
18. Registration of two dates of digital imagery involves the same procedures as geometric correction of a single image.
  - a. true
  - b. false
19. Which of the following are examples of good ground control points to use in image rectification?
  - a. intersections of highways and airport runways
  - b. lakes and streams
  - c. large areas of homogenous vegetation
  - d. all of the above

20. Which of the following most fully and accurately describes edge enhancement of digital imagery?
  - a. is a per pixel operation
  - b. involves linear combinations of two or more spectral bands
  - c. uses convolution filtering, and more specifically, a low pass filter, to change the spatial frequency characteristics of the image
  - d. uses convolution filtering, and more specifically, a high pass filter, to change the spatial frequency characteristics of the image
  
21. When geometrically correcting imagery, resampling refers to
  - a. calculating correct output pixel locations
  - b. repeating the selection of ground control points
  - c. calculating the DN values of output pixels
  - d. convolution filtering
  
22. Concerning the different methods of resampling, which of the following is true?
  - a. nearest neighbor resampling preserves the radiometric responses of the individual pixels in the original imagery and is therefore recommended for digital classification
  - b. cubic convolution results in the highest quality imagery for visual appearance and interpretation
  - c. both a and b
  - d. neither a or b, resampling has to do with repeating the selection of ground control points
  
23. Ratios and other linear transformations of multispectral data
  - a. accentuate the effects of varying soil backgrounds, topography and illumination
  - b. reduce the effects of varying soil backgrounds, topography and illumination
  - c. accentuate differences between soil and vegetation
  - d. a and c
  - e. b and c
  
24. Most algorithms for classification of digital imagery rely on
  - a. spectral-radiometric variations in the imagery
  - b. spatial patterns and texture
  - c. temporal response patterns
  - d. all of the above
  
25. The parameters used to describe class signatures for a maximum likelihood classifier are
  - a. median and standard deviation
  - b. mean vector and covariance matrix
  - c. conditional and prior probabilities
  - d. reflectance and radiant temperature
  
26. Which is more critical to accurate image classification?
  - a. good classifier training
  - b. selection of a robust classifier
  3. access to a high-speed computer with at least 100 Gb of disk space and 1000 Mhz RAM
  
27. As a general rule, to ensure to good training, pixels of entire fields, including pixels near the boundaries or edges, should be included in training sets in order to represent "mixed" pixel classes.
  - a. true
  - b. false
  
28. An advantage(s) of the minimum distance to means classifier is/are
  - a. insensitivity to image misregistration
  - b. use of mean and variance information in the decision rule
  - c. simplicity and speed
  - d. accuracy
  - e. all of the above

29. In addition to minimum distance to the means and maximum likelihood classifiers, the following are possible/available and may improve classification accuracy.
  - a. hybrid approaches of supervised and unsupervised training and classification
  - b. contextual, layered, and fuzzy classifiers
  - c. classifiers such as neural networks which may incorporate and use non-spectral data
  - d. all of the above
30. Important considerations in the selection of fields or pixels for supervised training include
  - a. all important classes are included
  - b. representativeness of the training samples
  - c. number of training sites and pixels per class
  - d. homogeneity and variance of the class
  - e. all of the above
31. In unsupervised training the analyst might select for "clustering" subsets of the image that are expected to contain all of the expected cover type classes.
  - a. true
  - b. false
32. The basic premise(s) in unsupervised approaches to classifier training is/are that
  - a. pixels of a given spectral-radiometric (cluster) class are likely to be members of the same cover type class
  - b. pixels of a given cover type class are more likely to have similar spectral-radiometric responses than pixels of different classes
  - c. both a and b
  - d. neither a or b
33. After determining the desired classes for a supervised training approach to image classification, the next step would be to
  - a. cluster the entire image into N+1 classes where N is the number of desired classes
  - b. choose representative training samples of each class
  - c. apply radiometric and spatial enhancements such as contrast stretch and edge enhancement
  - d. select the classifier
34. Digital classification approaches have eliminated the need for field or reference data.
  - a. true
  - b. false
35. Training fields provide an accurate and unbiased estimate of digital classification accuracy.
  - a. true
  - b. false
36. Acquisition, registration and classification of imagery acquired at different dates
  - a. may increase classification accuracy because it takes advantage of the inter-temporal covariance of cover types
  - b. is more expensive than acquisition and processing of single-date imagery
  - c. most likely will not increase the accuracy
  - d. is simply not possible
  - e. a and b
37. One approach to change detection is to compare the class differences in classifications of data acquired at two different dates. This approach
  - a. provides "from-to" change class information
  - b. is efficient because the base year classification for subsequent change detection is already completed
  - c. is highly dependent on the accuracy of each of the individual classifications
  - d. a and c
  - e. a, b and c

38. If the classification of image differences approach to change detection is followed
- it would be a good idea to first radiometrically calibrate the imagery to remove differences in atmosphere and/or sun angle between dates
  - "from-to" change class information is readily available
  - the images should be at very similar dates and phenology
  - a and c
  - a, b and c
39. "Landscape variables" which may affect classification accuracy include
- number of cover types classified
  - variance within vs. among cover types
  - number, size and shape of "parcels"
  - variation in soils and topography
  - all of the above
40. A classification error matrix
- is an N x N matrix where N is the number of classes
  - compares the classes of classified and reference pixels
  - provides the basic calculating errors of omission and commission
  - provides the basic data for calculating overall accuracy
  - all of the above
41. What is the overall classification accuracy of a classification of 4 cover type classes given the following data?

Reference Class	Pixels Classified As			
	A	B	C	D
A	50	10	6	4
B	6	40	8	6
C	8	4	34	2
D	2	2	2	16

- 60%
  - 70%
  - 74%
  - 82%
42. An assessment of a classification of 12 cover type classes over a county-sized area provided the following data. The classifications of a sample of 1000 randomly selected pixels were compared to field determinations of the actual class on a pixel by pixel basis and 900 were found to be correctly classified. The "expected agreement by chance" was 20%. What is the Kappa coefficient of agreement for this classification?
- .70
  - .90
  - .875
  - .80
  - cannot be determined from these data
43. The radiant temperature of an object is
- always more than its kinetic temperature
  - determined by its emissivity and kinetic temperature
  - measured by a thermometer
  - all of the above
44. Thermal imagery can be collected at night, as well as during the day, and unlike visible and near infrared imagery, is not affected by clouds or haze.
- true
  - false
45. An advantage of airborne digital camera systems is that the imagery is free of geometric errors.
- true
  - false

46. Compared to film, airborne digital cameras
- have higher spatial resolution than small format cameras
  - provide wider geographic coverage at similar spatial resolutions
  - have greater dynamic range
  - a, b and c
  - a and c
47. The following spectral-radiometric data (DN's) have been acquired by the Landsat Thematic Mapper: band 1 = 8, band 2 = 13, band 3 = 10, band 4 = 50, band 5 = 20, band 6 = 72, and band 7 = 15. What is the NDVI of the data?
- 0.67
  - 40
  - 60
  - 1.50
48. Ratios of responses in two spectral bands
- are useful in accentuating the effects of varying soil backgrounds, topography, and illumination
  - are used to normalize or reduce the effects of varying soil backgrounds, topography, and illumination
  - may accentuate differences between soil and vegetation
  - a and c
  - b and c
49. A temporal profile of the IR/red ratio or the normalized difference vegetation index can provide information on
- vegetation type
  - duration of vegetative greenness
  - biological productivity
  - effects of drought or other stress
  - all of the above
50. Which of the following convolution filters (kernels) will enhance edges?
- |   |  |   |
|---|--|---|
| <p>a.</p> $\frac{1}{9} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ | <p>b.</p> $\frac{1}{9} \begin{bmatrix} -1 & -1 & -1 \\ -1 & 16 & -1 \\ -1 & -1 & -1 \end{bmatrix}$ | <p>c.</p> $\frac{1}{9} \begin{bmatrix} 8 & 2 & 6 \\ 4 & 1 & 4 \\ 6 & 2 & 8 \end{bmatrix}$ |
|---|--|---|