FOR 504 - Questions that need answering…

Spectral Separability
1. According to Jensen, what are the necessary criteria of a spectral index?
2. Explain what steps you would undertake to develop and then evaluate a novel spectral index to assess the impact of fires on riparian vegetation.
3. Explain how knowledge of the M-statistic between two classes should enable a robust choice of band threshold between those two classes.

Alternative Classification Methods
4. Explain the difference between the Hopfield and Perceptron neural network models.
5. Describe how you would use a CART to evaluate urban growth. What sort of data would you use and what sort of CART method?
6. Explain why you might boost trees in a CART?

Data Fusion
8. Describe the difference between data fusion and data integration.
9. Describe how you would fuse Lidar with hyperspectral imagery.
10. Describe how the Hue Saturation Value (or HSI) data fusion methods work.
11. Explain the advantages of the Gram-Schmidt data fusion method over HSV.

Spectral Unmixing
12. Describe the mechanistic difference between linear and non-linear spectral unmixing.
13. What are the underlying assumptions when performing linear spectral unmixing?
14. Describe how you would evaluate whether two mineral soils mix linearly or non-linearly when spread out in an ‘intimate’ mixture.
15. Describe how you would evaluate whether two vegetation types mix linearly or non-linearly when spread out in a ‘checkerboard’ mixture.

Fourier and Wavelet Analysis
16. Describe why the Fourier reconstruction of a square wave will never be square. Why is this not true for reconstruction with wavelet analysis?
17. What are the basic criterions of a wavelet?
18. Provide an explanation of the terms mother function, daughter function, dilation, and translation.
19. Describe the main advantages of wavelet analysis over operator-based methods.
20. What is the wavelet intensity and what can you use it for?
21. What is the wavelet variance and what does it tell you?
22. Discuss the main limitations of the Strand et al 2-D wavelet method – how would you propose overcoming them?
23. Describe how you would use Fourier analysis to correct an image with multiplicative errors.
Texture
24. What is texture?
25. Explain how occurrence measures are often used to classify an image.
26. From your knowledge of intensity classification methods such as ISODATA and maximum likelihood, explain how you would use a co-occurrence matrix to classify an image into different textural classes.
27. Describe a method other than wavelets for objectively characterizing the size of visible objects in an image. How would you use this information to decide the image resolution required to map these objects?
28. Suggest two mathematical textural filters, besides a standard deviation filter, that would also characterize local pixel variability in an image. Defend your choices.

Lidar
29. Explain why the last return in a discrete return lidar system is not always the ground.
30. Describe sources of error in a lidar acquisition.
31. Which is more accurate: lidar or field measured tree heights?

Scale Issues
32. Explain the concepts of Diffusion and Cohesion as they pertain to a classified image. Discuss likely advantages and disadvantages with producing a diffuse or cohesive Landcover map.
33. Describe Jensen’s’ Inequality. Why is this important when considering scaling from field to remote sensing measures?
34. NDVI is often correlated with fractional green vegetation cover. Discuss whether this correlation implies causation.

Fire
35. Describe, in terms of a temporal continuum, the terms fire intensity, fire severity, and burn severity.
36. Describe how you would use remote sensing to monitor the recovery of decadal net ecosystem productivity (NEP) following a fire event.