



MACHINE LEARNING FOR SOIL AND CROP MANAGEMENT

Assignment- Week 5

TYPE OF QUESTION: MCQ/MSQ

Number of questions: 15

Total mark: 15 X 1 = 15

QUESTION 1:

In the visible region of spectrum, which shows lowest reflectance peak?

- a. Soil
- b. Snow
- c. Habitation
- d. Crops

Correct Answer: d

Detailed Solution: In the visible region between $0.4\mu\text{m}$ and $0.7\mu\text{m}$; lowest soil reflectance occurs with crops.

QUESTION 2:

Which of the following is an example of ground-based sensors?

- a. EO-1 Hyperion
- b. HYSI
- c. FTIR
- d. AVIRIS

Correct Answer: c

Detailed Solution: Spectroradiometer, FTIR, Imaging spectrometer are some of the examples of ground-based hyperspectral sensors.



QUESTION 3:

Which of the following statements is/are correct?

- a. Infrared spectra are sensitive to both organic and inorganic soil materials.
- b. Mid-infrared spectra provide direct information on soil organic and mineral components of soil than the visNIR range.
- c. The absorption features detected in the vis-NIR range are fewer, broader, and more complex than those recorded in the MIR.
- d. All of the above

Correct Answer: d

Detailed Solution: Infrared spectra are sensitive to both organic and inorganic soil materials. The mid-infrared spectra provide the direct information on soil organic and mineral components of the soil than the visible and near-infrared (vis-NIR) range. Various components of the soil organic matter have very distinct spectral signature in the mid-infrared range. The reason is that the fundamental molecular vibrations occur in the mid-infrared range, while the overtones and combinations occur in the visNIR. The absorption features detected in the vis-NIR are fewer, broader, and more complex than those recorded in the MIR.

QUESTION 4:

In the visible region of spectrum, which shows highest reflectance peak?

- a. Bare Sandy Soils
- b. Silty Water
- c. Plantation Crops
- d. Field Crops

Correct Answer: a

Detailed Solution: In the visible region between 0.4 μ m and 0.7 μ m; maximum soil reflectance occurs with Bare Sandy Soils.



QUESTION 5:

During scanning soil with non-uniform particle sizes such as soils, the reflectance spectrum is often accompanied by _____.

- a. Scattering noise
- b. Larger spatial coverage
- c. High spectral reflectance
- d. No self-shadowing

Correct Answer: a

Detailed Solution: During scanning soil with non-uniform particle sizes such as soils, the reflectance spectrum is often accompanied by scattering noise.

QUESTION 6:

To extract the complex patterns and obtain quantitative estimates of a soil property, mathematical transfer functions are used to correlate spectral wavelength to soil properties. The transfer function is calibrated using the spectral wavelength as independent variables and the laboratory measured values of soil properties as the dependent variable.

- a. True
- b. False

Correct Answer: a

Detailed Solution: To extract the complex patterns and obtain quantitative estimates of a soil property, mathematical transfer functions are used to correlate spectral wavelength to soil properties. The transfer function is calibrated using the spectral wavelength as independent variables and the laboratory measured values of soil properties as the dependent variable. Once calibrated on the spectra, the soil property can be predicted using the spectral information only.

QUESTION 7:

What is the full form of FWHM concerning the sampling interval?

- a. Full-width-half-maximum
- b. Full-width-half-minimum
- c. Frequency-width-high-mode
- d. Fourier-window-histogram-method



Correct Answer: a

Detailed Solution: Spectral sampling interval is the spacing between sample points in the spectrum. Spectral resolution is defined as the full-width-half-maximum (FWHM) of the instrument response to a monochromatic source.

QUESTION 8:

In a _____ spectral preprocessing operation, each wavelength value is taken as the average of the neighboring wavelengths.

- a. Savitzky-Golay filter
- b. Moving window
- c. Continuum removal
- d. All of these

Correct Answer: b

Detailed Solution: In a moving window spectral preprocessing operation, each wavelength value is taken as the average of the neighboring wavelengths.

QUESTION 9:

What does soil spectroscopy primarily analyze?

- a. Soil moisture only
- b. Soil organic and mineral components
- c. Soil temperature variations
- d. Only soil color



Correct Answer: b

Detailed Solution: Soil spectroscopy can be used for the analysis of both organic (carbon, nitrogen) and mineral (clay, iron oxide) components.

QUESTION 10:

Vis-NIR diffuse reflectance spectroscopy is a technology that operates in the spectral range of:

- a. 350-700 nm
- b. 700-2500 nm
- c. 350-2500 nm
- d. 1000-1800 nm

Correct Answer: c

Detailed Solution: Vis-NIR diffuse reflectance spectroscopy is a technology that operates in the spectral range of 350-2500 nm (350-700 nm: Visible and 700-2500: NIR region)

QUESTION 11:

What is the advantage of using spectral preprocessing?

- a. It reduces noise and enhances spectral features
- b. It increases data complexity
- c. It eliminates the need for spectral libraries
- d. It replaces machine learning models in spectral analysis

Correct Answer: a

Detailed Solution: Spectral preprocessing techniques like SNV, MSC, and Savitzky-Golay filtering improve data quality by reducing noise and normalizing spectra.



QUESTION 12:

How does spectral trimming improve data quality?

- a. It enhances spectral resolution
- b. It removes low signal-to-noise ratio (SNR) regions
- c. It increases data redundancy
- d. It modifies spectral reflectance

Correct Answer: b

Detailed Solution: Trimming removes noisy spectral regions (e.g. below 500 nm and above 2450 nm), improving prediction accuracy.

QUESTION 13:

Find out the wrong statement:

- a. Panchromatic deals with one very wide band.
- b. Multispectral deals with several to tens of bands.
- c. Hyperspectral deals with hundreds of narrow bands.
- d. Ultraspectral deals with ten to hundreds of narrow bands.

Correct Answer: d

Detailed Solution: Ultraspectral data sets are composed of thousands of narrow band which is beyond hyperspectral.



QUESTION 14:

What does a spectral library contain?

- a. A collection of spectral signatures for different soil types
- b. A list of soil sample locations
- c. A record of soil temperatures
- d. A database of satellite images

Correct Answer: a

Detailed Solution: A spectral library is a collection of reflectance spectra used for identifying and predicting soil properties.

QUESTION 15:

Which of the following spectral indices is used in water deficit stress detection in rice?

- a. NDVI
- b. RSI and NDSI
- c. Clay index
- d. Organic Matter Index

Correct Answer: b

Detailed Solution: RSI and NDSI are spectral indices used for detecting water deficit stress in rice.