KATHMANDU UNIVERSITY
End Semester Examination [C]
11, April, 2023

Marks Scored:

Level : B.E.
Year : IV
Course : GEOM 402
Semester: I

Exam Roll No. :
Time: 30 mins.
F.M. : 10

Registration No.:
Date :

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate alternative from each set of choices.

1. Which of the following measurement of electromagnetic radiation is not important for the remote sensing system?
   a. Reflected electromagnetic radiation
   b. re-radiated electromagnetic radiation
   c. Emitted electromagnetic radiation
   d. Transmitted electromagnetic radiation

2. The spacing between pixels on the ground is called .....
   a. Ground- Projected sample interval (GSI)
   b. Spatial resolution
   c. Ground- Projected instantaneous field of view (GIFOV)
   d. Field of View (FOV)

3. Earth observation satellite is an example of .....
   a. Terrestrial remote sensing
   b. Ground based remote sensing
   c. airborne remote sensing
   d. space borne remote sensing

4. In which range of electromagnetic spectrum does the earth emits its highest amount of electromagnetic radiation?
   a. Visible range
   b. Optical range
   c. Thermal infrared range
   d. Microwave range

5. Which of the following statement is **true**?
   a. As wavelength increases to the shortwave radiation, less radiation is available from the sun.
   b. As wavelength increases to the long wavelength radiation, less radiation is available from the sun.
   c. As wavelength increases to the shortwave radiation, more radiation is available from the sun.
   d. As wavelength increases to the long wavelength radiation, more radiation is available from the sun.

6. The maximum value of solid angle one satellite can have at a time is .....
   a. π steradians
   b. 2π steradians
   c. 3π steradians
   d. 4π steradians

7. The origin of the image coordinate system lies at .....
   a. Upper left of image array
   b. Upper right of image array
   c. Lower left of image array
   d. Lower right of image array

8. Which of the following image format is suitable if one is mainly interested in accessing pixels of several band at one time?
   a. Band Sequential (BSQ)
   b. Band Interleaved by Sample (BIS)
   c. Band Interleaved by Line (BIL)
   d. Band Interleaved by Pixel (BIP)

9. Synthetic Aperture Radar (SAR) image makes use of ..... Portion of Electromagnetic spectrum.
   a. Ultraviolet b. Optical c. Infrared d. Microwave

10. Noise reduction in the image can be done by using .....
   a. High pass filter
   b. Low pass filter
   c. Edge detection filter
   d. Gradient filter

11. Which of the following filter has sum of the weight is zero?
   a. High pass filter
   b. Low pass filter
   c. High boost filter
   d. Band pass filter

12. The contrast enhancement done by stretching linearly between minimum and maximum value without considering the histogram is called .....
   a. Linear Stretch
   b. Histogram Equalization
   c. Piecewise linear stretch
   d. Saturation stretch

13. Principal component analysis (PCA) technique is used in remote sensing .....
   a. To map the image into number of classes
   b. To enhance the appearance of the image
   c. To reduce the dimensionality of the image
   d. To reduce noise in the image

14. After downloading an image from a particular source, you came to know that there is some line of zero. What kind of error is this?
   a. Periodic line dropout
   b. Line stripping
   c. salt and pepper effect
   d. spikes

15. If an image is taken with solar zenith angle of 30 degree. One representative DN value of that image is 40, then corrected DN value after sun angle correction is .....
   a. 80 b. 20 c. 46 d. 35

16. The error in the image scene due to terrain relief falls under .....
   a. Mistakes
   b. Systematic error
   c. Random error
   d. compensating error

17. Which of the following is the correct order for radiometric calibration and correction?
   a. DN number, At sensor radiance, TOA reflectance, Surface reflectance
   b. DN number, TOA reflectance, Surface reflectance, At sensor radiance
   c. Surface reflectance, TOA reflectance, At sensor radiance, DN number
   d. Surface reflectance, At sensor radiance, TOA reflectance, DN number

18. If the supervised classification is done by using Landsat image which spatial unit of analysis as image pixel, then the minimum mapping unit (MMU) is usually .....
   a. 30 hectares
   b. 0.09 hectares
   c. 0.30 hectares
   d. 9 hectares

19. Which of the following is the algorithm for the un-supervised classification?
   a. Minimum distance
   b. Parallelepiped
   c. Maximum Likelihood
   d. K-mean classifier

20. Which of the following statement is not true in case of orthorectification?
   a. Orthorectification does correction of image for topographic distortion
   b. Orthorectification convert the image in an orthographic projection
   c. Orthorectification is done before preparation of topographic map from the image
   d. Digital Elevation Model (DEM) doesn't required for orthorectification

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SECTION "B"
[8Q × 5 = 40 marks]

Attempt *ANY EIGHT* questions.

1. Why remote sensing is demanding field in the present context than traditional methods of surveying? In which principle remote sensing system is guided by? [2+3]

2. Justify the following statements. [2 × 2.5 = 5]
   a. Sky appears blue during the day.
   b. The sun radiates the electromagnetic energy in its highest amount in visible wavelength range.

3. Briefly explain the radiation components involved in acquiring image using thermal infrared portion of remote sensing system. [5]

4. The following is a 5×5 sub image of a remote sensing scene. Calculate the value of center of output image using the following filter. [2+2+1]
   a. 5×5 high pass filter
   b. 5×5 Low pass filter
   c. Median Filter

85	87	95	94	84
75	95	90	27	96
65	86	92	97	87
68	100	94	67	76
66	77	87	78	66

5. a. How you can correct the image to remove atmospheric error using empirical line method? [2]

   b. Atmospheric correction with the assumption of Lambertian surface. We measured surfaces using a spectroradiometer when Sentinel 2 passing through the site. Here are the surface reflectance values and their corresponding DN values.

Surface	Surface spectral reflectance	At-sensor DN
Clean water	0	15
Snow	0.85	230
Soil		100

Specification for ETM+ band1:

Pixel size: 10 m
Radiometric resolution: 8 bit
Gain: 4DN/(W/m2srμm)
Band Width: 630-690 nm
Orbit: Polar orbit
Offset: -2 DN

i. Using empirical line approach, what is the surface reflectance of soil?
ii. Using concept of DOS, estimate the spectral path radiance You can convert at-sensor spectral radiance Lλ to DN using the gain and offset information.

[1.5+1.5]

6. What is the role of image enhancement in digital image? List different techniques used contrast enhancement. Describe any one of them. [1+2+2]

7. What is the basic objective for image classification in context of remote sensing? List out its processes. Discuss about the different possibilities to categories classifiers. [1+1+3]

8. The given table represents confusion matrix of 4 different Land Use/ Land Cover. [1×5 = 5]

Land Use/Land Cover	Urban	Crop	Water	Forest	Barren
Urban	150	21	7	17	30
Crop	2	730	24	115	21
Water	3	18	83	8	3
Forest	23	81	4	350	13
Barren	39	8	3	11	115

Calculate:

i. User accuracy of Water
ii. Producer accuracy of Forest
iii. User Accuracy of Urban
iv. Producer Accuracy of Crop
v. Kappa coefficient

9. Write short notes on (*ANY TWO*): [2 × 2.5 = 5]

a. Principal Component Analysis (PCA)
b. Spectral Reflectance Curve
c. Histogram Equalization