

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

MAR 27 2017

Level : B. E.
Year : IV
Time : 2 hrs. 30 mins.

Course : GEOM 402
Semester : I
F. M. : 40

SECTION "B"

Attempt *ANY EIGHT* questions.

1. Why isn't classification 100% accurate? Discuss how classification accuracy can be increased? [2+3]
2. Remote sensors measure the radiance of a ground target. Define the term radiance (giving the units of measurement) and explain why remote measurements of radiance only partially capture ground reflectance characteristics. [2+3]
3. Briefly explain the conceptual basis of the linear contrast stretch. Line or column striping is a problem often encountered in multispectral remote sensing. Describe two methods for correcting line or column striping. [2+3]
4. The following is a 3×3 sub image of a remote sensing scene: Derive the smoothed value at the central pixel using the following filters: [3+2]

- a. 3×3 High boost filter (k=2)
- b. 3×3 Low pass filter

95	94	84
86	27	96
100	97	87

5. Atmospheric correction with the assumption of lambertian surface. We measured surfaces using a spectroradiometer when Landsat ETM+ passing through the site. Here are the surface reflectance values and their corresponding DN values. [3+2]

Surface	Surface spectral reflectance	At-sensor DN
Clean Water	0	40
Snow	0.8	200
Soil	?	100

Specification for ETM+ band1:

Pixel size: 30m

Radiometric resolution: 8-bit

Gain: $4DN/(W/m^2sr\mu m)$

Band width: 630-690nm

Orbit: Polar orbit

Offset: -2 DN

- a. Using empirical line approach, what is the surface reflectance of soil?
 - b. Using concept of DOS, estimate the spectral path radiance. You can convert at-sensor spectral radiance L_λ to DN using the gain and offset information in the equation ($DN = \text{offset} + \text{gain} \times L_\lambda$).
6. What do you understand by instrument response? How does sensor modify spatial response of a scene? [2+3]

7. The RADAR equation can be stated in terms of received power, P_r at a RADAR antenna as:

$$P_r = \frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 R^4}$$

Define the various terms in the equation and outline the various physical principles that determine the form of the equation. [5]

8. What do you understand by minimum mapping unit (MMU)? Describe approaches in image segmentation. [2+3]
9. Write short notes –attempt *ANY TWO* [2.5+2.5]
- a. Point spread function
 - b. Range resolution
 - c. BRDF
 - d. SAR

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Marks Scored:

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Registration No. :

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SECTION "A"

[20 Q. × 0.5 = 10 marks]

Tick the most appropriate answer.

1. Due to the mach band effect, the intensity at the boundary between brighter and darker object appears to be
 - a. Brighter
 - b. Darker
 - c. We cannot see objects for short time
 - d. No change in intensity
2. Soil moisture content on earth can be best characterized by the use of EMR in
 - a. NDVI region
 - b. Optical region
 - c. Microwave region
 - d. Atmospheric absorption region
3. Select the most correct answer from the following statement
 - a. A sensor with larger spectral band width has highest radiometric resolution
 - b. A bigger pixel size results in higher radiometric resolution
 - c. A sensor with narrower spectral band width has lower spectral resolution
 - d. A sensor with high revisit time has high spatial resolution
4. An area appearing grey in true color composite is due to
 - a. Grey colour of an object
 - b. Equal reflectance of RGB bands
 - c. 50% reflectance in RGB bands
 - d. 50% reflectance in RG and 0% in B band
5. Contrast enhancement is used in image
 - a. To reduce noise
 - b. To increase the contrast between the DN values of the pixels
 - c. To reduce the effect of sun angle and topography
 - d. To compensate for the energy lost during transmission
6. Choose the most appropriate answer for band pass filter
 - a. Reinforces the individual bands of the original image
 - b. Isolates periodic noise
 - c. Isolates low frequency components
 - d. Removes signal of the original images
7. A paralleiped classification approach uses
 - a. Highest probability of a pixel falling into each classes
 - b. Mean and median values to assign class
 - c. Minimum and maximum value to assign class
 - d. Least standard deviation to assign class

8. Dark object subtraction method relies on the assumption that
 - a. The atmospheric effect are represented by lowest DN values
 - b. Two objects with zero reflectance and highest reflectance are able to correct atmospheric effects
 - c. Radiative transfer codes also best method for atmospheric correction
 - d. Conversion of signal into digital number is done in atmospheric correction

9. Which of the following statement is true in case of noise
 - a. Global noise refers to random variation at some pixels of image
 - b. Noise can be separated using low pass filter
 - c. Noise cannot be separated from images
 - d. Local noise refers to individual bad pixels and lines

10. What type of model models the light scattered by oxygen?
 - a. Mie
 - b. Molecular
 - c. Rayleigh
 - d. Aerosol

11. According to the Planck's Radiation Law, the exited energy is peaked at what spectral region for the sun
 - a. 0.4-0.5 μm
 - b. Visible region
 - c. Thermal region
 - d. Near infrared region

12. Automatic technique for destriping uses
 - a. High pass filter and threshold to isolate noise spectrum
 - b. Low pass filter to isolate noise spectrum
 - c. Band pass filter
 - d. Low pass filter followed by high pass filter

13. An object can be detect but not resolved when
 - a. The contrast between the feature and surrounding is high
 - b. When the GIFOV is similar than the object size
 - c. GSI is smaller than GIFOV
 - d. None of above

14. What factors can influence the spatial resolution substantially?
 - a. Earth-Sun distance
 - b. Seasonality
 - c. Flight height
 - d. SNR

15. Which of following sensor(s) are active one(s)?
 - a. ETM+
 - b. LiDAR
 - c. ASTER
 - d. MODIS

16. What filter consist of a local maximum filter
 - a. Opening
 - b. Low pass
 - c. High boost
 - d. High pass

17. Sum of weightings of the following filter is greater than zero
 - a. High pass
 - b. High boost ($k = 2$)
 - c. Low pass
 - d. Vertical

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18. Surface roughness in radar sensing system is
 - a. Speckles that are inherent to radar systems
 - b. Terrain property that most strongly influences the strength of the radar backscatter
 - c. Radar property that changes with change in system characteristics
 - d. Geometric distortions that are present in radar images

19. Radar backscatter coefficient depends on
 - a. Surface roughness
 - b. Moisture content
 - c. Frequency of waveform
 - d. All of above

20. When the surface micro-relief is larger than the wavelength of radar system, the backscatter is
 - a. Specular-no return
 - b. Diffuse return-strong return
 - c. Diffuse return-moderate return
 - d. Specular-strong return

