KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks scored:

Level : B. E.
Year : IV

Course : GEOM 402
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 05 MAR 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Tick the most appropriate answer from the given choices.

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

2. Select the most correct answer:
   a. The amount of electromagnetic radiation an object emits partially depends on its temperature.
   b. The higher the temperature of an object, the longer its peak wavelength of emitted radiation.
   c. The total energy emitted from an object varies as fourth power of temperature.
   d. The lower the temperature of an object, the shorter its peak wavelength of emitted radiation.

3. The full across track angular coverage of remote sensing satellite is called _____.
   a. field of view
   b. ground-projected field of view
   c. swath width
   d. footprint of sensor

4. The area of spectrum which are not severely influenced by atmospheric absorption and thus, are useful to remote sensors, are called _____.
   a. atmospheric windows
   b. electromagnetic spectrum
   c. electromagnetic radiation
   d. polarization

5. Select the incorrect statement regarding energy interaction with the Earth surface:
   a. The proportion of reflected, absorbed and transmitted electromagnetic energy will vary for the Earth's different features.
   b. For a given feature type, the proportion of reflected, absorbed and transmitted electromagnetic energy will vary at different wavelength.
   c. The geometric manner in which the Earth's individual feature reflects electromagnetic energy is a function of surface roughness of that feature.
   d. The proportion of transmitted electromagnetic energy by a given feature at different wavelength is shown by spectral reflectance curve.

6. Which of the following is not radiation component used for passive remote sensing system?
   a. Un-scattered surface reflected radiation
   b. Path emitted radiance
   c. Down-scattered surface reflected skylight
   d. Up-scattered path radiance

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. The pre-launched gain and bias coefficient for band 4 of the Landsat TM are 1.082 and 2.2373 respectively. What will be the value of radiance corresponding to the DN value of 124?
   a. 278.507 W. sr. m^{-2}
   b. 121.932 W. sr. m^{-2}
   c. 136.405 W. sr. m^{-2}
   d. 54.940 W. sr. m^{-2}

9. 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)

10. If the minimum and maximum DN value of a scene of 8-bit image is 10 and 170 respectively. The image is subject to the min-max linear stretch, then what is the DN value of the pixel whose original DN value is 80?
   a. 128 b. 80 c. 85 d. 150

11. The most common type of 5×5 high pass filter has a weight of ____ at its center.
   a. -1 b. 8 c. 1 d. 24

12. Empirical line method relies on the assumption that _____.
   a. the atmospheric effect is represented by the lowest DN values
   b. two objects with zero reflectance and the highest reflectance are able to correct atmospheric effect
   c. radiative transfer codes are the best method for atmospheric correction
   d. conversion of signal into digital number is done in atmospheric correction

13. Which of the following interpolation technique produces the smoothest image?
   a. Nearest Neighbor
   b. Bilinear interpolation
   c. Cubic Convolution
   d. Polynomial interpolation

14. Line stripping in an image can be de-stripped by _____.
   a. replacement method
   b. histogram equalization method
   c. correlation method
   d. averaging method

15. Cloud appears white to our eyes due to _____.
   a. Rayleigh scattering
   b. Mie scattering
   c. non-selective scattering
   d. diffuse scattering

16. The calculated coordinate of three control points are (10,10), (15, 10) and (20,15) respectively. The corresponding ground measured coordinates are (13,11), (12, 11) and (17,16) respectively. Then, the RMSE of transformation is _____.
   a. $\sqrt{10}$ unit b. $\sqrt{3}$ unit c. $\sqrt{5}$ unit d. $\sqrt{6}$ unit

17. A minimum distance classification approach used _____.
   a. the highest probability of a pixel falling into each class
   b. mean and median values to assign class
   c. minimum and maximum values to assign class
   d. least standard deviation to assign class

18. If supervised classification is done 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 difference measure is not used to define the interclass separability in separability analysis?
a. Euclidean b. Mahalanobis c. Bhattacharya d. Convergence

20. The recent image used by Survey Department of Nepal for updating the topographic database is
a. Rapid-Eye image b. Landsat image c. World-View image d. Sentinel image

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SECTION "B"
[8Q × 5 = 40 marks]

Attempt *ANY EIGHT* questions.

1. What do you mean by resolution? List and explain in brief different type of image resolution. [1+ 4]

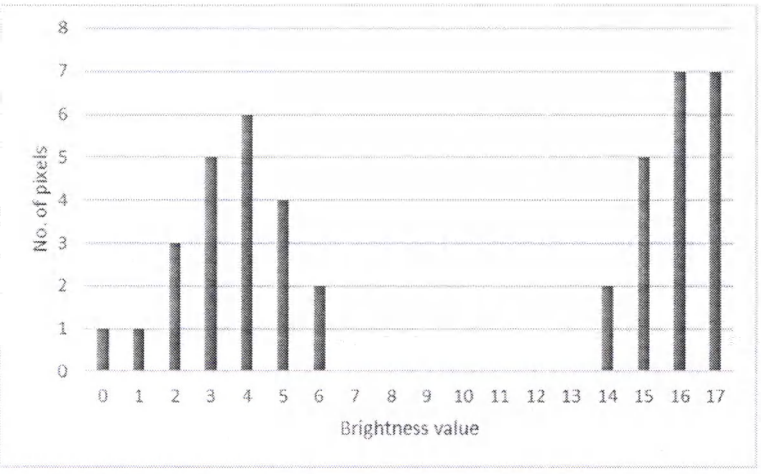
2. a. How does electromagnetic energy interacts with the Earth surface? How does a remote sensing specialist determine the feature of the Earth surface through this interaction? [1+2]
   b. If you need to select image to extract information about the Earth's certain feature, how will you determine it? Explain it with example. [2]

3. a. What interaction does play a major role in extracting the information about the atmospheric constituents? How are remote sensing systems designed for it? [2+1]
   b. Justify the following statements. [1+1]
      i) The sun radiates the electromagnetic energy in its highest amount in visible wavelength range.
      ii) Definition of signal noise is problem dependent

4. Why principal component analysis (PCA) is important for remote sensing image pre-processing? Calculate first and second PCA and their contribution using the following correlation matrix. [1+4]

	Band 1	Band 2	Band 3
Band 1	1	0.957	-0.195
Band 2	0.957	1	-0.066
Band 3	-0.195	-0.066	1

5. The following figure represents histogram of an image under consideration. Prepare final histogram of the image after applying histogram equalization technique. [5]



6. a. How does size of kernel affects an image? Explain it with an example. [2]
   b. The following is a 3×3 sub image of remote sensing scene. Derive the smoothed image using 3×3 high boost filter (k = 2). [3]

56	67	89
12	55	23
77	88	99

7. Prepare a table for a geometric distortion of satellite image containing types of errors, its sources, effects, natures and direction of errors. [5]

8. How does parallelepiped algorithm assign boundaries in a feature space? What is the limitation of classical parallelepiped algorithm? How does this limitation can be overcome? [2+1+2]

9. Complete the given confusion matrix and calculate overall accuracy and kappa coefficient of the image classification. [3+2]

		Evaluation Classes				
Map Classes		Forest	Urban	Water	User Accuracy	Error of Commission
	Forest	?	5	3	83.33%	?
	Urban	?	35	4	?	?
	Water	5	?	50	90.91%	?
	Producer Accuracy	80%	?	?		
	Error of omission	?	?	?		