

KATHMANDU UNIVERSITY
End Semester Examination
28 - December 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 option from each set of choices

- If the orientation of electric vector is parallel to the plane of coincidence then it is termed as _____
a. Vertical Polarization
b. Random Polarization
c. Horizontal Polarization
d. Unpolarization
- If the frequency of the light is 1 hz , calculate the energy of radiated photon
a. 6.626×10^{-34} W
b. 3.313×10^{-34} J
c. 3.313×10^{-34} W
d. 6.626×10^{-34} J
- How do you calculate the solid angle?
a. $\omega = \frac{A}{R}$
b. $\omega = \frac{A}{R^2}$
c. $\omega = \frac{R}{A^2}$
d. $\omega = \frac{R}{A}$
- The unit of radiant exitance is :
a. $\frac{\omega}{m}$
b. $\frac{\omega}{m^2}$
c. $\frac{m}{\omega^2}$
d. $\frac{\omega}{m^3}$
- The fact that sky appears 'blue' during the day and 'redish' during sunset or sunrise is the manifestation of :
a. Mie Scattering
b. Rayleigh Scattering
c. Non Selective Scattering
d. None of the mentioned
- Normalized Difference Vegetation Index (NDVI) is calculated by :
a. $NDVI = \frac{Red - NIR}{Red + NIR}$
b. $NDVI = \frac{Red - SWIR}{Red + SWIR}$
c. $NDVI = \frac{NIR - Red}{NIR + Red}$
d. $NDVI = \frac{SWIR - Red}{SWIR + Red}$
- What is opening in Morphological Filter?
a. Opening = dilation[dilation[binary image]]
b. Opening = dilation[erosion[binary image]]
c. Opening = erosion[dilation[binary image]]
d. All of the above
- The temporal resolution of Landsat is:
a. 5 days
b. 18 days
c. 21 days
d. 10 days
- The value of Normalized Difference Snow Indexes (NDSI) Ranges from:
a. [0,1]
b. [-1,+1]
c. [-1,0]
d. None

10. Geo-stationary satellites are generally _____ km above equator.
 a. 22,000 b. 26,000 c. 36,000 d. 20,000
11. Landsat ETM+ image has 6000 rows (or lines) and 6600 columns (or samples) which consists of 6 bands with 8 bit per pixel size and Bands ranging from 1-5, 7 (vis/NIR). Calculate the size of the image?
 a. 322.21 MB b. 226.59 MB c. 444.94 MB d. 308.21MB
12. Which of the following is true about Low Pass Filter?
 a. Preserve Local Mean b. Sum of their weight is one
 c. Used for smoothing d. All of the mentioned
13. Which of the following is not Supervised Classification Technique?
 a. Maximum Likelihood b. K-Means Clustering
 c. Random Forest d. Support Vector Machine
14. The number of digital levels used to express the data collected by the sensor is
 a. Spatial Resolution b. Radiometric Resolution
 c. Spectral Resolution d. Temporal Resolution
15. Linear Filter follows the principle of:
 a. Principle of Composition b. Principle of Conservation
 c. Principle of Superposition d. Principle of Decomposition
16. Which of the following is the **CORRECT** order for radiometric calibration and correction?
 a. At sensor radiance, TOA reflectance, Surface reflectance, DN number
 b. Surface Reflectance, TOA reflectance, At Sensor radiance, DN number
 c. DN number, TOA reflectance, Surface reflectance, At Sensor radiance
 d. DN number, At sensor radiance, TOA reflectance, Surface reflectance
17. If an image is taken with solar zenith angle of 30 degree. One representative DN value of that image is 60, then corrected DN value after sun angle correction is :
 a. 120 b. 45 c. 90 d. 30
18. Calculate the overall accuracy from given confusion matrix
- | | | Evaluation classes | | | Tot. |
|-------------|------|--------------------|---|---|------|
| | | a | b | c | |
| Map classes | A | 3 | 0 | 0 | 3 |
| | B | 0 | 2 | 2 | 4 |
| | C | 1 | 0 | 2 | 3 |
| | Tot. | 4 | 2 | 4 | 10 |
- a. 70% b. 50% c. 85% d. 92%
19. The angle of inclination for Sun-Synchronous satellites are:
 a. 0 Degree b. 15-30 Degrees c. 60 Degrees d. 98-99 Degrees
20. What will be the solid angle projected in the surface area of $2\pi R^2$?
 a. $2\pi R$ b. 2π c. π d. $\pi/2$

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SECTION "B"

[6 Q × 4 = 16 marks]

Attempt *ANY SIX* questions. Assume suitable data if necessary.

1. Define polarization. Explain in brief about Electromagnetic spectrum ranges. [1+3]
2. How do you define solid angle? What will be the solid angle projected in the surface area of $2\pi R^2$? [3+1]
3. Differentiate between Whiskbroom and Push broom scanning? Explain in brief about different image format. [2+2]
4. Explain in brief about different types of filter for spatial transform? [4]
5. What is Energy Conservation Principle? Explain in brief about Remote Sensing Process. [1+3]
6. Define Image Classification. Explain how Support Vector Machine (SVM) works? [1+3]
7. Write Short Notes on *ANY TWO*. [2 × 2 = 4 marks]
 - a. Histogram Equalization
 - b. Remote Sensing System
 - c. High Pass Filter
 - d. Periodic Line Dropout

SECTION "C"

[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Suppose you are chosen as a Remote Sensing Analyst for classifying Landuse/Land Cover change in Kavrepalanchowk District. The following confusion matrix was developed after the classification which shows the reference data and classified data for different classes using classification technique.

	Reference Data				
		Corn	Soyabeans	Forest	Other
Classified data	Corn	25	5	10	3
	Soyabeans	2	50	6	5
	Forest	3	4	60	5
	Other	2	2	2	100

Calculate Overall Accuracy, User's Accuracy, Producer's Accuracy, Error of Omission and Error of Commission and Kappa Coefficient. Explain whether this classification is appropriate or not?

9. Define Opening and Closing in Morphological filter. MODIS has 36 bands, two (bands 1 -2) 300m, five (bands 3-7) 500m and rest (8-36) 1000m spatial resolution with 16-bit pixel size. The number of sample are 4800 and lines are 4800 in bands 1 and 2. Calculate the image size. [3+5]
10. Define Principal Component. Find the first principal and second principal components and their contribution from following correlation matrix. [2+ 6]

Band	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6
Band 1	1	0.96	0.92	-0.19	0.64	0.81
Band 2	0.96	1	0.97	-0.07	0.77	0.89
Band 3	0.92	0.97	1	-0.13	0.83	0.94
Band 4	-0.19	-0.07	-0.13	1	0.18	-0.07
Band 5	0.64	0.77	0.83	0.18	1	0.93
Band 6	0.81	0.89	0.94	-0.07	0.93	1