Ref. No.: SC/GEOG/PG/CORE/TH/13/2023

M.Sc. 2rd Year 1st Semester Examination 2023

Geography

Course Code: SC/GEOG/PG/CORE/TH/13

Paper: Geoinformatics (GEOG-C213T)

Time: 2 Hours **Full Marks: 50**

Answer one question from each unit

UNIT-I: Physics of Remote Sensing

1. a) What will be the unit of radiant flux (ϕ) in SI format when $\phi = \frac{dQ}{dt}$ and Q = radiant energy? Mention the mathematical expression of atmospheric radiance (L). What is bi-directional reflectance distribution function in remote sensing? 1+2+2

   b) Which size-class of atmospheric particles are affected by Raman scattering? Explain briefly the significance of using wavelength range of 8-14 μm in remote sensing. A Synthetic Aperture Radar transmits pulses over duration of 0.1 micro seconds. Find the ground range resolution of the system at a depression angle of 45°. 1+2+2

2. a) How do NIR and MIR wavelengths of electromagnetic radiation interact with water? 'For opaque terrestrial materials, their emissivity and reflectivity are complementary to each other' – Justify the statement. The wavelength corresponding to maximum spectral radiance of a body is 0.5 μm. The ratio of temperature of two black bodies is 20. What will be the wavelength corresponding to maximum spectral radiance of the other black body? 2+1+2

   b) A geostationary satellite is orbiting the earth at a height 4R above the surface of the earth, where R is radius of earth. Determine the time period of this orbiting satellite. Compare the relative advantage and disadvantage of using plane polarizations and cross polarizations in microwave remote sensing. 2+3

UNIT-II: Principles of Digital Image Processing

3. What are the requirements of atmospheric corrections of an image? Find out the number of pixels covered by an industrial estate with an area of 45 ha on a classified Sentinel-2 MSI image. What is NDWI? 5+3+2

4. If the time taken by the mirror to scan one line for a satellite with velocity (v), instantaneous field of view (β radian), operating at height (h), and areal footprint of detector on the ground (r) is 't', then provide the mathematical expression for 't'. Discuss relative importance of NDVI and supervised classification in interpreting the nature and extension of vegetation of an area. Differentiate producer's accuracy from user's accuracy. 2+5+3

UNIT-III: Database Management in GIS

5. Define metadata. Comment on the importance of attribute data in GIS? Along a physiographic cross section of AB, there are six points of measurement, namely P1 (2 m), P2 (4 m), P3 (6 m), P4 (x m), P5 (8 m), and P6 (6 m). Estimate the elevation of P4 (missing data) using local and global interpolations. 2+6+2

6. Illustrate with examples the utilities of raster data and vector data in spatial planning. What is the importance of building topology in vectorisation? Calculate the value of Moran's Index (I), when c_{ij} = Geary's Index; total spatial proximity between two objects i and j ($\sum_i \sum_j w_{ij}$) = 0.80; sample standard deviation (s) = 1.20; and $\sum_i \sum_j w_{ij}\, c_{ij} = 0.75$. 5+3+2

UNIT-IV: Modelling in GIS

7. What do you understand by digital map? What does geospatial visualization refer to? Which are the visual variables that allow to distinguish cartographic symbols from each other? 2+3+5

8. Comment on the visualization model – TIN. What is spatial interpolation? State in detail the process to determine the neighbourhood of a target in a GIS platform. 2+3+5

Internal Assessment ***10***