

INDIAN STATISTICAL INSTITUTE
FOURTH SEMESTER EXAMINATION, 2022/24 SESSION
PAPER - 19: GEOGRAPHICAL INFORMATION SCIENCE (ELECTIVE)
(MASTER IN LIBRARY INFORMATION SCIENCE)
30th April 2024 (10:00-13:00) (3 Hours)

This Question paper consists of one page is for **60 Marks**. To score maximum marks, attempt the maximum number of questions. Print your answers in the Answer Booklet provided. A Scientific Calculator is allowed.

QUESTION 1. Write briefly about

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| (i) Geographical Information Science (GISci) | [3 marks] |
| (ii) Social (Modified) Gravity Model | [3 marks] |
| (iii) Morphological Granulometries | [3 marks] |
| (iv) Geodesic Spectrum over the Width Function | [3 marks] |

QUESTION 2. Assuming that the mean salary of a district is taken as a variable, and that variable indicates the social happiness index. The district-wise mean salaries are available for a cluster of adjacent but non-overlapping political districts. Disparity in mean salaries shows the disparities in social happiness index. How do you quantify such a social disparity in the happiness index from the mean salary data available for the adjacent districts in a cluster? [10 marks]

QUESTION 3. The areal spread of a lake is available in temporal mode at the four-month intervals in a year. This means the lake's areal spread is available thrice a year in image form. How to generate a sequence of the lake's areal spread image data at maximum possible times with much shorter intervals. [10 Marks]

QUESTION 4. Over a geographical space, there are significantly large number of water bodies, and the spatial distance between any two adjacent water bodies is considerably larger. The population's water source is the only water from the nearest water body. Due to prevailing drought conditions, all the water bodies dried up, and the government can afford to fill only one water body in a cluster of water bodies to minimize the social conflicts among the population living in that cluster. In such a scenario, which water body can the government choose from the cluster to fill to minimize social conflicts? Write your arguments to provide a spatial policy. [10 Marks]

QUESTION 5. The Digital Elevation Model (DEM), a spatial field depicting elevations above the mean sea level across the spatial positions, depicting a desert region at two time instants with a time gap of 365 days. The DEMs available at two-time instants are highly discrete. What approach would you follow to show the DEM at one time instant transforming into the DEM at the other instant almost in the near continuum? Provide the approach as comprehensive as possible. [8 Marks]

QUESTION 6. Several spatial objects, which are compact and convex, exist over a geographical space. Those spatial objects are non-overlapping, and the distance between adjacent spatial objects is significantly larger. Provide an approach you are familiar with to provide a directional relationship between the spatial objects automatically. [10 marks]

QUESTION 7. V-shaped and delta-shaped crenulations in elevation contours testify to the presence of ridge and valley elements. Elevation contours and valley and ridge connectivity networks are necessary topological quantities from DEMs. Explain the extraction of these quantities from the DEMs via approach you are familiar with. [10 marks]

QUESTION 8. Write elaborately about (i) network morphometric analysis and the two critical topological quantities that could be computed via Horton's laws of numbers and mean lengths and (ii) the area-altitude hypsometric method to quantify the stages of watersheds. [10 marks]

END OF PAPER