



Birla Institute of Technology & Science, Pilani

Hyderabad Campus

First Semester 2022-2023

CE F431 Principles of Geographical Information Systems

Comprehensive Examination

Weightage: 40%

Maximum Marks: 40

Duration: 3 Hours

Date: 31.12.2022

Nature of Exam: Closed Book

Answer All Questions

Section :1

1. Complete the grid given below.

[3M]

Along

- 1) A geo-statistical method of spatial interpolation [7]
- 2) The orientation of slope [6]

Down

- 3) Type of SAR resolution [7]
- 4) Unsupervised classification method [7]
- 5) Law of physics related to spatial resolution [6]
- 6) The value of pixel in DTM [9]

Note: The number in the bracket shows the number of letters.
No need to redraw the grid for answer. Just write the answer against its corresponding number.

1		4				
	2,3		5	6		

2. Differentiate between the following.

[1*5= 5M]

- a) Depth First Search vs Breadth First Search
- b) WGS 1984 vs UTM
- c) Kriging vs IDW
- d) Constrained Delaunay triangulation vs Unconstrained Delaunay triangulation
- e) Route vs Event

3. State true or false and justify your answer.

[0.5*6=3M]

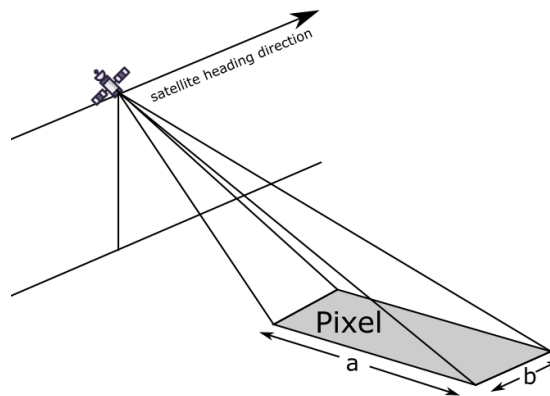
- a) Vegetation can be identified by extracting pixels with NDVI <0
- b) The spatial interpolation technique based on IDW computes the error of interpolation.
- c) TIN is a 2D model representing the irregular tessellation of the terrain
- d) For UTM projection, scale factor between the two standard meridian is less than one.
- e) The strength of the signal recorded by satellite sensor system corresponds to its spectral resolution
- f) The time series images of Sentinel-2 data were limited during monsoon season

4. Explain how you are going to apply the geo-spatial technology in the domain of intelligent transportation system. Include the following in your answer. [3M]

- The specific domain
- How Geospatial technology is important in that domain?
- Types of datasets required for the analysis
- List the algorithm required for executing the problem.

Section: II.

1. What is XML? How is it useful in Map service operations? Explain the role of XML in client-server connectivity using a neat diagram. [4M]
2. Write at least two differences between WFS and WCS? [2M]
3. Explain why we cannot make a Nadir-looking SAR system? Explain with a diagram. [2M]
4. Which are the range and azimuth resolutions (shown as a and b in the figure given below)? Why are these resolutions different in a SAR remote sensing system? [2M]



Section: III

1. a) Explain Dijkstra's algorithm. [2+3=5M]
b) Adjacency matrix corresponding to a network is given below.

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>
<i>a</i>	0	20	0	0	0	0	15	0
<i>b</i>	20	0	8	9	0	0	0	0
<i>c</i>	0	8	0	6	15	0	0	10
<i>d</i>	0	9	6	0	7	0	0	0
<i>e</i>	0	0	15	7	0	22	18	0
<i>f</i>	0	0	0	0	22	0	0	0
<i>g</i>	15	0	0	0	18	0	0	0
<i>h</i>	0	0	10	0	0	0	0	0

Identify the shortest route and corresponding distance from node *b* to node *g* using Dijkstra's algorithm. Write steps for each iteration either in the same table or in a different table. Draw the corresponding network.

- 2) a) Draw a semi-variogram with-reference to Kriging and mark all the semi-variogram parameters. Also. explain the parameters. **[1.5M]**

- b) The details of elevation datasets of certain locations are given below. Determine the elevation of the point ' O ' using ordinary Kriging method. **[4.5M]**

Details of datasets for Kriging

Point	x (m)	Y (m)	Elevation (m)
1	2	2	3
2	3	7	4
3	9	9	2
4	6	5	4
5	5	3	6
O	5	5	?

The semi-variogram is fitted with the spherical model and is given by

$$\gamma(h) = 2.5 + 7.5 \left(\frac{3}{2} \cdot \frac{h}{10} - 0.5 \cdot \left(\frac{h}{10} \right)^3 \right), \text{ where } h \text{ is the distance in m.}$$

- 3) The 3x3 window of an elevation raster is given below. Calculate the slope and aspect of the centre pixel of the following raster data considering 8 connectivity. The resolution of each cell is 10 m. **[2M]**

Elevation raster

1006	1012	1017
1010	1015	1019
1012	1017	1020

- 4) Calculate the least cost path from the top leftmost pixel to bottom rightmost pixel using Dijkstra's algorithm (source raster). The cost raster is given below. **[3M]**

Cost raster

1	2	2
1	4	5
2	3	7

Source raster

-----All the Best-----