BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.Sc./Pre-PhD **SEMESTER: II/I**
BRANCH: Remote Sensing **SESSION: SP/2024**

SUBJECT: GI518 SPATIAL DATA HANDLING THROUGH PROGRAMMING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL

Q.1(a)	Explain the concepts of data frames in R environment. Describe the following statement sequence.
	`x <- 10:1`
	`y <- -4:5`
	`q <- c ("Hockey", "Football", "Baseball", "Curling", "Rugby",`
	`+ "Lacrosse", "Basketball", "Tennis", "Cricket", "Soccer")`
	`theDF <- data.frame(x, y, q)`
	`theDF`
		[5]	CO1	Remember

Q.1(b)	Describe the concept of slicing and generating regular sequences in R with suitable examples.	[5]	CO1	Understand

Q.2(a)	Explain the significance of Correlation and justify the statement, "Correlation does not imply causation". Describe the following statement sequences.
	`library(ggplot2)`
	`head(economics)`
	`cor(economics$pce, economics$psavert)`
	where `pce` is personal consumption expenditures and `psavert` is the personal savings rate.
		[5]	CO2	Apply

Q.2(b)	Some students were given a task to plot the rainfall over some of the coordinates without taking ground truth values. The students utilized the following snippets in R environment to perform the activities. Describe the statement sequences and explain the outputs generated.
	`name <- LETTERS[1:10]`
	`longitude <- c(-116.7, -120.4, -116.7, -113.5, -115.5,`
	`-120.8, -119.5, -113.7, -113.7, -110.7)`
	`latitude <- c(45.3, 42.6, 38.9, 42.1, 35.7, 38.9,`
	`36.2, 39, 41.6, 36.9)`
	`stations <- cbind(longitude, latitude)`
	
	`set.seed(0)`
	`precip <- round((runif(length(latitude))*10)^3)`
	`psize <- 1 + precip/500`
	`plot(stations, cex=psize, pch=20, col='red',`
	`main='Precipitation')`
	`# add names to plot`
	`text(stations, name, pos=4)`
	`# add a legend`
	`breaks <- c(100, 250, 500, 1000)`
	`legend.psize <- 1+breaks/500`
	`legend("topright", legend=breaks, pch=20,`
	`pt.cex=legend.psize, col='red', bg='gray')`
		[5]	CO2	Analyze

Q.3(a)	Describe the output of the following statement sequences?		**CO3**	**Apply**

(i)	`string = "Harry"`
	`n = len(string)`
	`mystery = string [0] + string[n - 1]`
	`print(mystery)`
		[5]		

(ii)
```
for i in range(3) :
    for j in range(5) :
        if i % 2 == j % 2 :
            print("*", end="")
        else :
            print(" ", end="")
    print()
```

Q.3(b)	Explain the concept of Immutability in python with some examples and which data structure could be utilized to resolve the challenges posed by this?	[5]	CO3	Evaluate
Q.4(a)	Describe the concept of the functions in Python. Explain the importance of recursive functions.	[5]	CO4	Understand
Q.4(b)	Describe the output of the following statement sequence.	[5]	CO4	Apply

```
def main() :
    printTriangle(4)
def printTriangle(sideLength) :
    if sideLength < 1 : return
    printTriangle(sideLength - 1)
    print("[]" * sideLength)
main()
```

Q.5(a)	Explain the process of Customizing layer visualization through Google Earth Engine. Describe following GEE snippets.	[5]	CO5	Understand and apply

```
Map.addLayer(image, {min: 0, max: 3000}, 'custom
visualization');
Map.addLayer(image, {min: 0, max: 3000, palette: ['blue',
'green', 'red']},'custom palette');
```

Q.5(b)	Describe the code snippets from a GEE code and explain the outputs at each step.	[5]	CO5	Evaluate

```
var point = ee.Geometry.Point([-122.292, 37.9018]);
var l8 = ee.ImageCollection('LANDSAT/LC08/C02/T1_TOA');
var image = ee.Image(
  l8.filterBounds(point)
    .filterDate('2015-01-01', '2015-12-31')
    .sort('CLOUD_COVER')
    .first()
);
var nir = image.select('B5');
var red = image.select('B4');
var ndvi =
nir.subtract(red).divide(nir.add(red)).rename('NDVI');

Map.centerObject(image, 9);
var ndviParams = {min: -1, max: 1, palette: ['blue', 'white',
'green']};
Map.addLayer(ndvi, ndviParams, 'NDVI image');
```

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