

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

**CLASS: MTECH & PRE\_PHD  
BRANCH: REMOTE SENSING**

**SEMESTER: IInd & Ist  
SESSION: SP/2023**

**SUBJECT: RS522 PROGRAMMING CONCEPTS FOR SPATIAL DATA HANDLING  
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.
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- Q.1(a) Explain the following C program by taking any input of your choice. [5] CO C01
- ```
int smaller(int a, int b);
main()
{
  int a, b, min;
  printf("Please enter the first number: ");
  scanf("%d", &a);
  printf("Please enter the second number: ");
  scanf("%d", &b);
  min = smaller(a, b);
  printf("\nThe smaller number is: %d", min);
}
int smaller(int a, int b)
{
  if (a <= b)
  return(a);
  else
  return(b);
}
```
- Q.1(b) When passing an argument to a function, what is the difference between passing by value and passing by reference? To what types of arguments does each apply? [5] CO1
- Q.2(a) A file needs to be accessed from url given below. What would be the R code to load and read this url. Also, describe a brief working of the code. [5] CO2  
<http://www.jaredlander.com/data/TomatoFirst.csv>
- Q.2(b) Describe the following R script for raster data handing. [5] CO2
- ```
library(terra)
r <- rast(ncol=10, nrow=10, xmin=-150, xmax=-80, ymin=20, ymax=60)
r
values(r) <- runif(ncell(r))
r
values(r) <- 1:ncell(r)
r
plot(r)
lon <- c(-116.8, -114.2, -112.9, -111.9, -114.2, -115.4, -117.7)
lat <- c(41.3, 42.9, 42.4, 39.8, 37.6, 38.3, 37.6)
lonlat <- cbind(id=1, part=1, lon, lat)
pts <- vect(lonlat)
pols <- vect(lonlat, type="polygons", crs="+proj=longlat
+datum=WGS84")
points(pts, col="red", pch=20, cex=3)
lines(pols, col="blue", lwd=2)
r2 <- r * r
r3 <- sqrt(r)
s <- c(r, r2, r3)
s
plot(s)
```

**PTO**

- Q.3(a) Describe the output of the following Python script. [5] CO3
- ```
i = 0
total = 0
while total < 10 :
    i = i + 1
    total = total + i
    print(i, total)
```
- Q.3(b) Describe the following Python script for plotting a map. [5] CO3
- ```
fig, ax = plt.subplots(figsize=(10, 10))
sjer_plot_locations.plot(column='plot_type',
                        categorical=True,
                        legend=True,
                        marker='*',
                        markersize=65,
                        cmap='OrRd',
                        ax=ax)

ax.set_title('SJER Plot Locations\nMadera County, CA')
plt.show()

sjer_crop_extent_path = os.path.join("data", "spatial-vector-lidar",
"california", "neon-sjer-site", "vector_data", "SJER_crop.shp")
sjer_crop_extent = gpd.read_file(sjer_crop_extent_path)
```
- Q.4(a) Explain following MATLAB snippets. [5] CO4
- ```
A = 100;
whos A
A = [12 62 93 -8]
sz = size(A)
A = [12 62; 93 -8]
sz = size(A)
A = zeros(3,2)
B = ones(2,4)
A = [12 62 93 -8];
B = diag(A)
```
- Q.4(b) Describe the following section of MATLAB code for manually labelling multispectral image. [5] CO4
- ```
zipfile = "LC08_L1TP_113082_20211206_20211206_01_RT.zip";
landsat8Data_url =
"https://ssd.mathworks.com/supportfiles/image/data/" + zipfile;
downloadLandsat8Dataset(landsat8Data_url,pwd)
hCube =
hypercube("LC08_L1TP_113082_20211206_20211206_01_RT_MTL.txt");
rgbImg = colorize(hCube,Method="rgb",ContrastStretching=true);
rgbImg = imadjustn(rgbImg);
info =
georasterinfo("LC08_L1TP_113082_20211206_20211206_01_RT_B1.TIF");
R = info.RasterReference;
xlimits = R.XWorldLimits;
ylimits = R.YWorldLimits;
dataRegion = mappolyshape(xlimits([1 1 2 2 1]),ylimits([1 2 2 1
1]));
dataRegion.Project CRS = R.Project CRS;
```
- Q.5(a) What is the extension of shapefile allowed to upload on Google Earth Engine (GEE) as an asset? What is the meaning of function. first() and .mean()? [5] CO5
- Q.5(b) Compute the Normalized Difference Vegetation Index (NDVI) using GEE code. Write down the steps involved in doing so. [5] CO5