COLLEGE OF SCIENCE AND TECHNOLOGY

UNIVERSITY of
RWANDA

SCHOOL OF ENGINEERING

DEPARTMENT OF

CIVIL, ENVIRONMENTAL AND GEOMATIC ENGINEERING

END OF SEMESTER II EXAMINATION -ACADEMIC YEAR 2021-2022

YEAR: TRIMESTER: I PROGRAMME(S): SGE

MODULE: 3164 Geographical Information Systems I

DATE: 25/08/2022

TIME: 2hours

MAXIMUM MARKS = 50

INSTRUCTIONS

1. This paper contains **FOUR (4)** questions.
2. **Answer THREE (3) Questions only:**
   Question ONE (1) from Section "A" is <u>Compulsory</u> and Answer any TWO (2) from Section "B"
3. Any written materials and Programmable calculators are NOT allowed.
4. Do not forget to write your Registration Number.
5. Write all your answers in the booklet provided
6. Do not write any answers on this questions paper.
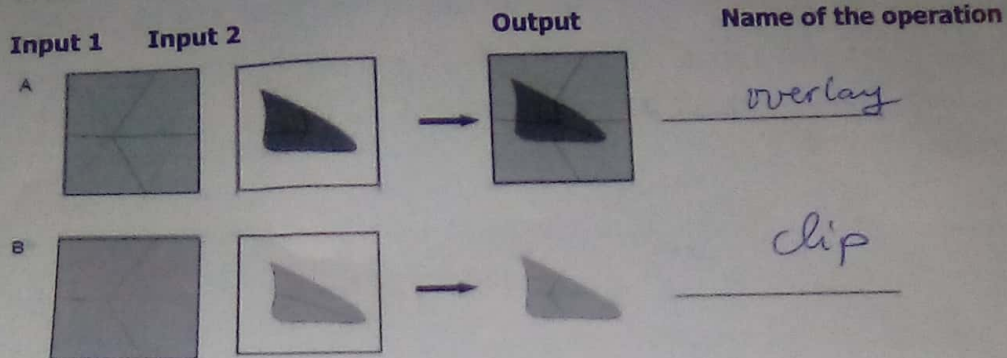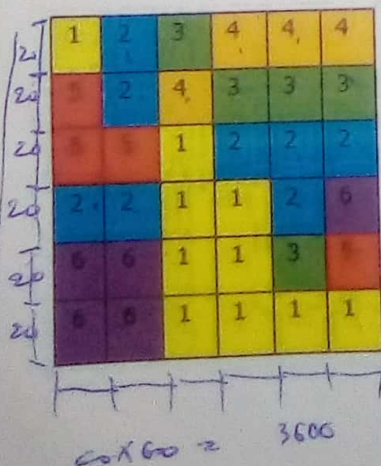7. **Start each question in a NEW page**

[20]

Question: 1

a) Figures below are indicating the inputs and the output of different types of overlay operations. Write down the name of each operation in the space provided in the right-hand column: [2]

Input 1	Input 2	Output	Name of the operation

A   →   _overlay_

B   →   _clip_

b) Discuss the advantages and disadvantages of adopting either a vector or a raster approach to data analysis [2]

c) Differentiate major group of geographical phenomenon and provide 3 examples per each group. [2]

d) Steps by step, explain how you can create a personal Geodatabase in GIS [2]

e) What are coordinate systems used in Rwanda? Explain The conversion procedure from Arc1960 to ITRF 1996 [2]

f) Give any 2 roles of GIS in Land surveying and administration [2]

g) What is a map scale? discuss main types of map scale [2]

h) Define DBMS and write down elements of DBMS [2]

i) The Following 20 m resolution Data Represents different land use categories in Kabare Village

2 *60

2 60 X 60

= 3600

6 X 60

1	2	3	4	4	4
	2	4	3	3	3
		1	2	2	2
2	2	1	1	2	6
6	6	1	1	3	
6	6	1	1	1	1

Purple (6) is <u>Residential</u>   1

Red (5) is <u>wetland</u>   2

Yellow (1) is <u>agriculture</u>   3

60 X 60 = 3600

Page 1 of 5

Green (3) is <u>Forest</u>   4

Blue (2) is Industrial zone

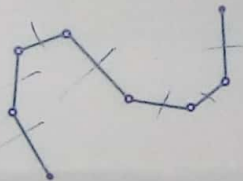**Orange (4)** is <u>open land</u>

i.   Determine area (in Ha) and percentage per every land use Category **[3]**

ii.   What is the data model for the given spatial data ? **[0.5]**

iii. What Computer representation is used to present that geographical phenomenon and type? **[0.5]**

SECTION: B

Question: 2   **[15]**

a) What are the elements of a map that can be omitted during the process of map design without affecting the quality of the map? Explain your answer **[1.5]**

b) Below is a diagram of a line. How many end nodes, start nodes, lines and arcs are within this figure? **[2]**

(handwritten answer)
end node: 2
Start N: 2
lines: 7
Arcs: 2

c) Write in full: **[2]**
    i.   GCS
    ii.   WGS
    iii. ITRF
    iv.   DEM
    v.   GIS
    vi.   GNSS
    vii. PGC
    viii. .shp

d) Write the correct result in the output raster C (T=True, F=False) according to the following condition:

$C = (A > 20)$ AND $(B = "A")$ **[3]**

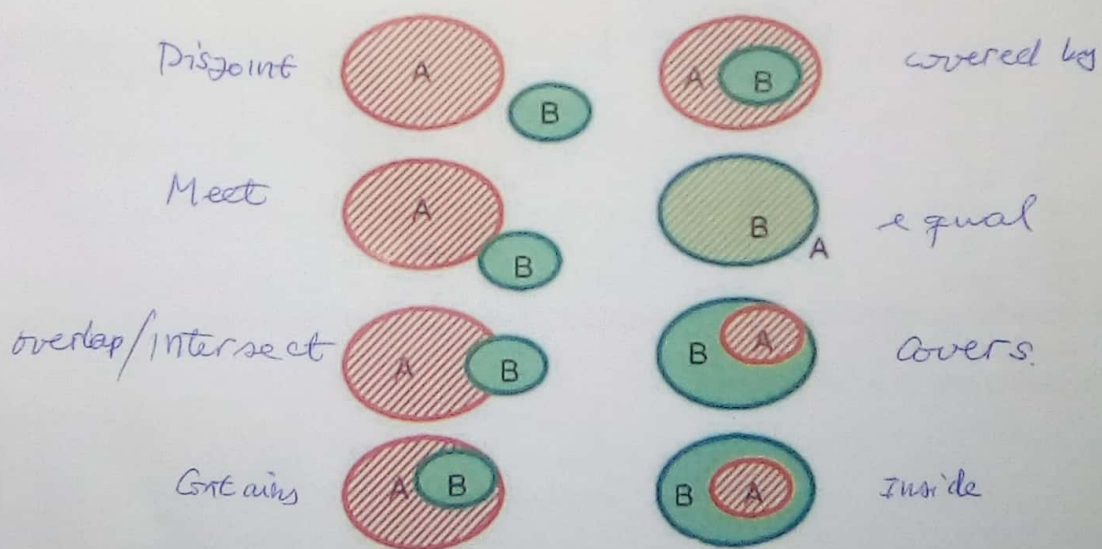| 10	12	15	20
11	14	16	21
21	34	31	34
25	36	37	41

B

A	B	B	B
A	A	B	B
A	A	B	B
B	B	B	B

e) When you export the map from the ArcMap, they are some formats that a designed map may have. List any FIVE of them **[2.5]**

f) Differenciate Regural and Irregular tesselations in digital data represnetion **[3]**

g) Outline any 4 geoprocessing tools **[1]**

Question: 3 [15]

a) Indicate the topological and spatial relationship present in The figure below **[4]**

Disjoint

Meet

overlap/Intersect

Contains

covered by

equal

Covers.

Inside

b) When adding labels to a map, where does the label field come from? **[1]**

in PROPERTIES

?

c) Name one way to symbolize quantitative data. **[1]**
d) What are some reasons to work in layout view? **[2]**
e) What are three things to consider before creating a map layout? **[1.5]**
f) What three properties are affected by map projections? **[1.5]**
g) Name 4 resources for finding existing GIS data in Rwanda. **[2]**
h) Name one way of defining location for a 2-D map. **[1]**
i) Say Yes or NO **[2], 0.5 each**
    i. A single layer can have points and polygons.
    ii. An attribute query needs a target layer and a source layer.
    iii. Customer lists that include name, addresses, and phone numbers can be turned into geographic data
    iv. Vector data can only represent man-made objects   No

Question: 4   [15]

a) What type of query would you use to answer the following questions? **[2.5]**

Questions	Location query or Attribute query?
Which Districts share a border with Kigali City?	
Which Buildings are 1000 square meter in size?	
Which District road crosses through six Districts borders?	
Which Business centers are three km from the District town ?	
Which Provinces have a population greater than 1120,000?	

b) List the steps in the GIS analysis process and describe how you could use the GIS analysis process to solve problems using GIS in your organization **[2]**

c) The phenomena in the table below have either crisp or fuzzy boundaries. Mark (with X) the correct answer for each phenomenon. **[2]**

Phenomenon	Crisp	Fuzzy
Soil pollution		
Building		
Natural vegetation		
Cadastral parcels		

d) In the table below indicate the correct type of data value. Select Data Text, Float, Double, Raster, Date, Integer **[2.5]**

	Data type: Text, Float, Double, Raster, Date, Integer
100.00	
High Resolution Photograph	
21.08.190	
30.0812359	

e) Define Overlay operation **[0.5]**

  i. Write two major categories of overlay **[1]**

  ii. determine the result of this overlay operation **[4]**

f) What is a spatial information **[0.5]**

0	0	0	0	0	0	0	0
0	1	1	1	1	0	0	0
0	1	1	1	1	0	0	0
0	1	1	1	1	0	0	0
0	1	1	1	1	0	0	0
0	0	1	1	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

0	2	0	0	0	0	0	0
0	2	0	0	0	0	0	0
0	2	0	0	2	0	2	0
0	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	2	0	0	0	0	2	0
0	0	0	0	0	0	0	0
0	0	2	0	0	0	0	0