



UNIVERSITY OF ESWATINI
Faculty of Health Sciences
Department of Environmental Health Science

B.Sc. DEGREE IN ENVIRONMENTAL MANAGEMENT AND
WATER RESOURCES

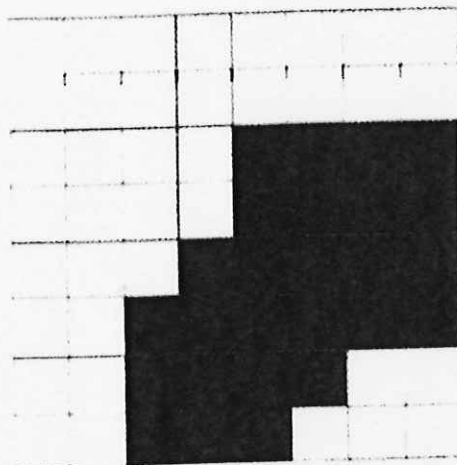
MAIN EXAMINATION PAPER 2021

TITLE OF PAPER	INTRODUCTION TO GIS AND REMOTE SENSING
COURSE CODE	EHS 452
DURATION	2 HOURS
MARKS	100
INSTRUCTIONS	<p>READ THE QUESTIONS & INSTRUCTIONS CAREFULLY</p> <p>ANSWER <u>ANY FOUR</u> QUESTIONS</p> <p>EACH QUESTION <u>CARRIES 25</u> MARKS.</p> <p>WRITE NEATLY & CLEARLY</p> <p>NO PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.</p> <p>BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.</p>

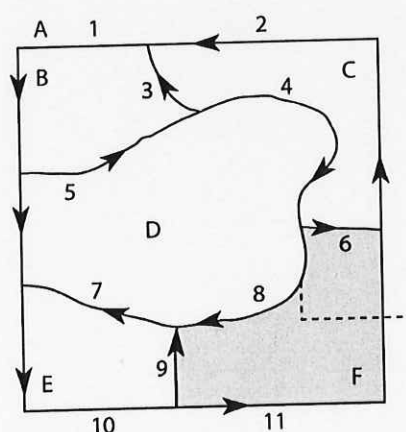
DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE (5 Marks each)

1A. For the raster image shown in the figure below prepare raster encoding using the quad tree raster encoding method.



1B. Prepare the left-right topology data structure for the network of polygons shown in the figure below.



1C. State the advantages of vector data models.

1D. Differentiate among the following four types of resolutions (1 mark each)

- i. Spatial resolution
- ii. Spectral resolution
- iii. Temporal resolution
- iv. Radiometric resolution

1E. State the maximum and minimum range of numbers that can be stored in a computer with each of the following number representation: Short integer

QUESTION TWO (5 marks each)

2A. What is the difference between a shape file and a coverage?

2B. For the student, course and instructor data shown below generate the following data models:

- i. Flat data base model (1 mark)
- ii. Hierarchical data base model (2 marks)
- iii. Network database model (2 marks)

Student	Course taken		Instructor	Course taught
A	N1, N2, N3		D	N1, N5
B	N1, N4, N5		E	N4, N2
C	N1, N3, N6		F	N3, N6

2C. Define the quantile data classification and state its advantages and disadvantages.

2D. Define and state the difference between the following two query statements used to select features in a GIS.

- i. COMPLETELY WITHIN (2 and ½ marks)
- ii. COMPLETELY CONTAIN (2 and ½ marks)

2E. Define the natural break (jenks) data classification and state its advantages and disadvantages.

QUESTION THREE (5 marks each)

- 3A.** The table below shows an attribute table with the name Exam_Table. Show the output of a QUERY statement having the following clause:

SELECT	LastName, FirstName, StreetNumber
FROM	Exam_Table
WHERE	StreetNumber >= 10000 AND StreetNumber < 100
ORDERED BY	LastName

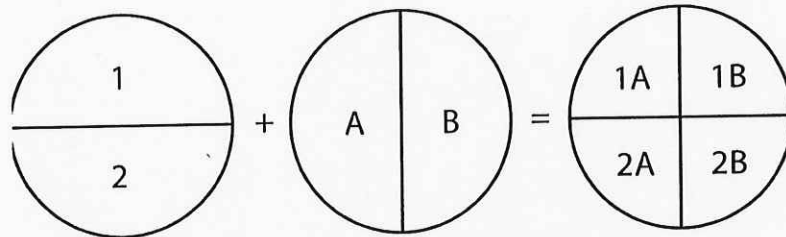
Last Name	First Name	Street Number	Street Name	City	State
Squires	Edwin	4589	Shamar Rd.	Upland	IN
Rothrock	Paul	91657	Carex Ave.	Upland	IN
Hess	Douglas	123	Fake St.	Springfield	IN
Peterson	Chris	4687	Windthrow Way	Kane	PA
Gibson	David	354	Bluestem St.	Carbondale	IL
Smith	Dan	267	Wetland Rd.	Vicksburg	MS
Lichvar	Bobby	888	Badboy Lane	Vicksburg	MS
Orme	Tony	6576	Lakebed Ave.	Los Angeles	CA
Gillespie	Tom	94	Longboard Pl.	Los Angeles	CA
McDonald	Glen	11	Pleistocene St.	Los Angeles	CA
Tanner	Dave	6969	Goldenrod Ave.	Newport Beach	CA
Ramirez	Ruben	987	Summer St.	Oceanside	CA
Zackey	Justin	1982	Bonroe Mill	Bryn Athyn	PA
Shuey	Jamie	45683	Wrong Way	Eugene	OR
Goncharenko	Eric	23846	Oso Avenida	Los Angeles	CA
Buckley	Chris	745	Hambone Ave.	Miami	FL
Brody	Richard	54	Sugarplum St.	Topanga	CA

- 3B.** Define the following type of buffers:

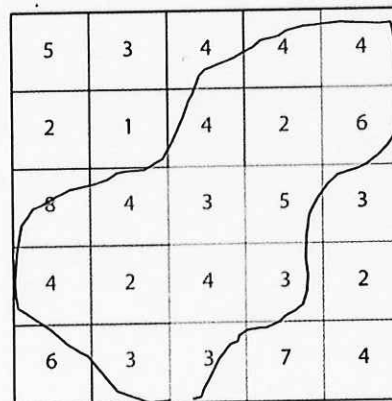
- i. Multiple ring buffers
- ii. Doughnut buffer
- iii. Bidirectional buffer
- iv. Setback buffer

v. Dissolved buffer

3C. State the type of vector processing operated on the two features shown in the figure below.



3D. Draw the output cell grid values of the clip operation carried out on the raster data set shown in the figure below.



3E. Carry out a nearest neighbor analysis to the raster cell data shown in the table below by means of averaging among the cell values of the nearest neighbors.

1	2	3	5
8	4	5	1
15	7	9	11

QUESTION FOUR (5 marks each)

- 4A. What is the difference between JPEG (Joint Photographic Expert Groups) and TIFF (Tagged file image format) file formats in terms of file compression characteristics.
- 4B. How does Rayleigh scattering take place. Give natural example of Rayleigh scattering.
- 4C. State the visible range remote sensed appearance of water under each of the following conditions:
- i. Clear water body that has greater depth such as lakes, seas and ocean (2 marks)
 - ii. Water that has suspended sediment in it (1 mark)
 - iii. Water that has algae growth in it (1 mark)
- 4D. Discuss the space orbit characteristics of geostationary satellites. For what purpose are geostationary satellites often used?
- 4E. List and describe the three methods of querying attribute data in a GIS.

QUESTION FIVE (5 marks each)

5A. List and define the five keys of a relational data base system.

5B. Using thermal infrared radiation detection by a remote sensor which feature appear brighter i) ground or ii) water or iii) reflecting metal surface such as aircraft? State the reason for your answer.

5C. Suppose you have a remotely sensed image using the false colour combinations involving the following three colour bands: infrared (shown as false red), near infrared (shown as false green) and green (shown as false blue). State the appearance of the following features on the satellite image (1 mark each)

- i. Atmospheric water droplet
- ii. Atmospheric ice
- iii. Sediment laden water in flooded zone
- iv. Saturated soil
- v. Vegetation

5D. What is the relationship between the spatial resolution of images obtained for aerial photogrammetry and each of the following factors:

- i. Focal length of cameras (2 and ½ marks)
- ii. The height of flight of the airplane? (2 and ½ marks)

5E. Describe the effect of dielectric constant and its influence on the appearance of remotely sensed image using RADAR for dry soil versus saturated soil.