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

B.Sc. DEGREE IN ENVIRONMENTAL MANAGEMENT AND
WATER RESOURCES

MAIN EXAMINATION PAPER 2020

TITLE OF PAPER   INTRODUCTION TO GIS AND REMOTE SENSING

COURSE CODE   EHS 452

DURATION   2 HOURS

MARKS   100

INSTRUCTIONS   READ THE QUESTIONS & INSTRUCTIONS
                              CAREFULLY

                              ANSWER **ANY FOUR** QUESTIONS

                              EACH QUESTION **CARRIES 25** MARKS.

                              WRITE NEATLY & CLEARLY

                              NO PAPER SHOULD BE BROUGHT INTO THE
                              EXAMINATION ROOM.

                              BEGIN EACH QUESTION ON A SEPARATE SHEET
                              OF PAPER.

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. Provide the numerical coding for storage of image in each quarter.
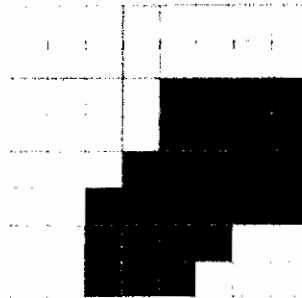
1B. Prepare the Arc-node topology data structure for the network of lines shown in the figure below.
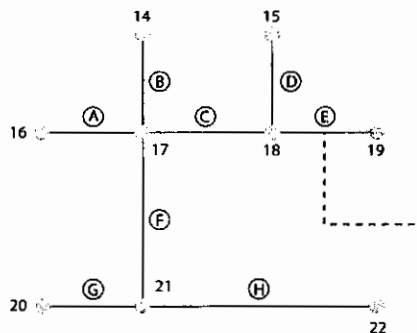
1C. List the disadvantages of vector data models.

1D. State Show and in what way the second normal form is violated in the following relational data base design

Table name: Class
Primary key Class_Code
Foreign key: Course_code

| Class_code	Class_room	Class_time	Course_code	Lect_code

1E. Describe how and for what purpose is the join operation carried out in a geographic information system context.

QUESTION TWO (5 marks each)

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

2B. List and describe the three methods of querying attribute data in a GIS.

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
      ii. COMPLETELY CONTAIN

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

QUESTION THREE (5 marks each)

3A. State the type of vector processing operated on the two features shown in the figure below.
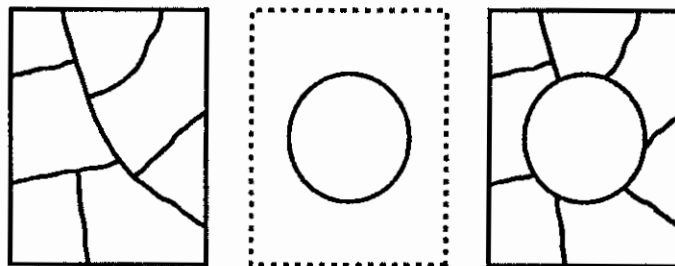
3B. Define reclassification in raster geo processing and state the advantages of reclassification in raster analysis.

3C. Supposing you have two different image files that you want to import for processing using the GIS. One image file is from a digital camera and the other image is scanned image from paper map. State the preferred file formats to use in each case in order to preserve the images.

3D. Describe and discuss the difference between i) additive colour model and ii) subtractive colour model.

3E. For the GIS based project network activities shown in the figure below, determine the critical path of the network.
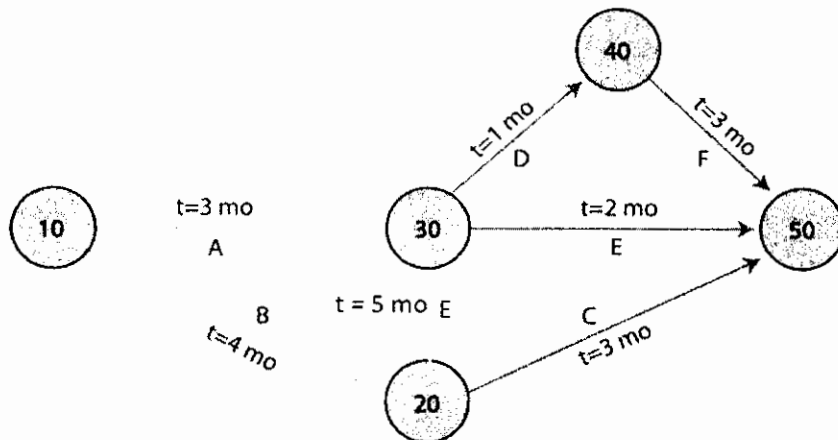
QUESTION FOUR   (5 marks each)

4A.   Using thermal infrared radiation detection by a remote sensor which feature appear brighter i) ground   ii) water   iii) reflecting metal surface such as aircraft?   State the reason for your answer.

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 oceans.
> ii. Water that has suspended sediment in it
> iii. Water that has algae growth in it.

4D.   Discuss the space orbit characteristics of geostationary satellites. For what purpose are geostationary satellites often used?

4E.   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:

> iv. Atmospheric water droplet
> v. Atmospheric ice
> vi. Sediment laden water in flooded zone
> vii. Saturated soil
> viii. Vegetation

QUESTION FIVE (5 marks each)

5A. What is the advantage of thermal infrared sensors compared to visible and near infrared sensors?

5B. Discuss how it is possible to estimate the amount of soil moisture using thermal infrared radiation sensors.

5C. Define the Normalised Difference vegetation Index (NDVI). State one application of NDVI.

5D. Discuss how thermal infrared radiation may be used to delineate flooded zones.

5E. Discuss how remote sensing may be used to study global ocean circulation in relation to prediction of events such as the El Nino.