



UNIVERSITY OF ESWATINI
FINAL EXAMINATION PAPER

PROGRAMME: BSc. AGRICULTURAL AND BIOSYSTEMS ENGINEERING
LEVEL 2

COURSE CODE: ABE210

TITLE OF PAPER: REMOTE SENSING AND GIS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER
QUESTIONS

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CHIEF INVIGILATOR

QUESTION ONE: COMPULSORY QUESTION

- a) Calculate the cost of Landsat ETM satellite data for a farm that is 15 km by 30 km in size. The spatial resolution of the ETM data is 10 m by 10 m, and the price of the data is E80 per MB. (20 marks)
- b) Using an example, discuss how the energy of quanta is related to the wavelength of electromagnetic energy. (10 marks)
- c) Determine the total radiation (W m^{-2}) from a surface that has a temperature of 30°C . The Stefan-Boltzmann constant is $5.6697 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$. (10 marks)

Total**40 marks****QUESTION TWO**

The table below shows reflectance values for three land features in the Red (ETM 3), Near Infra Red (ETM 4) and Middle Infra Red) bands.

Object/ land feature	Reflectance		
	Red Band	Near Infra Red Band	Middle Infra Red Band
A	51	61	140
B	35	14	9
C	24	130	74

- a) Calculate NDVI values for each of the three land features (15 marks)
- b) Specify the actual land cover type for each of the features based on the NDVI values if one of the features is water, one is bare dry soil and the other is dense vegetation cover. (6 marks)
- c) Discuss the difference between active remote sensing and passive remote sensing. (9 marks)

Total**30 marks**

QUESTION THREE

- a) Describe the three stages of supervised image classification, highlighting the activities under each stage. (15 marks)
- b) Describe the following terms as applied in remote sensing, using examples to illustrate your answers:
- i) Spatial resolution (8 marks)
 - ii) Temporal resolution (7 marks)

Total**30 marks****QUESTION FOUR**

- a) Calculate wavelength of maximum spectral radiant exitance for an object with temperature of 65°C. (10 marks)
- b) Describe three sources of data that can be used in vector GIS, highlighting the format at which the data is sourced. (12marks)
- c) Discuss two ways in which GPS can be used in management of land resources. (8 marks)

Total**30 marks**

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**UNIVERSITY OF ESWATINI
MAIN EXAMINATION PAPER**

PROGRAMME: BSc AGRICULTURAL AND BIOSYSTEMS ENGINEERING 2

COURSE CODE: ABE211

TITLE OF PAPER: ANIMAL DRAUGHT IMPLEMENTS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

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SECTION 1: COMPULSORY QUESTION**QUESTION 1**

- a. A span of draught oxen generates a pull in the chain of 1.21 kN when walking steadily in the field at an average speed of 0.9 m/s. Given that the angle of the chain is 16° to the horizontal, calculate:
- draught force, [5 marks]
 - power generated by the oxen [5 marks]
- b. What are the benefits and limitations of animal draught power in farming applications? [15 marks]
- c. A farmer approaches you for advice on how to select steers for draught work training. Discuss fully the physical features of the animal which the farmer should critically consider in the selection. [15 marks]

SECTION II: ANSWER ANY TWO (2) QUESTIONS**QUESTION 2**

- a. Name any five (5) animal species used for draught work and indicate the type of work each species is most suited for. [10 marks]
- b. List and explain cattle conformation features that influence their potential use in draught work. [10 marks]
- c. Define temperament and discuss how temperament affects the selection of animals for draft power. What are the signs of good temperament in draught animals? [10 marks]

QUESTION 3

- a. With the use of diagrams, discuss the "casting" and "gathering" forms of ploughing. [15 marks]
- b. Name and discuss the design and use of each of the three (3) types of double clamp yokes found in Swaziland [15 marks]

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QUESTION 4

- a. Discuss three (3) fixed costs associated with using draught animals as a source of power. **[15 marks]**
- b. Discuss three (3) factors that determine nutrient requirements of draught animals. **[15 marks]**