

UNIVERSITY OF SWAZILAND
DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND
PLANNING

SUPPLEMENTARY EXAMINATION : JULY 2007
B.Sc. III

TITLE OF PAPER : **INTRODUCTION TO REMOTE SENSING**

COURSE NUMBER : **GEP 313**

TIME ALLOWED : **THREE (3) HOURS**

INSTRUCTIONS : **SECTION A IS COMPULSORY**
ANSWER ANY TWO QUESTIONS FROM
SECTION B
ILLUSTRATE YOUR ANSWERS WITH
APPROPRIATE DIAGRAMS

MARKS ALLOCATED : **QUESTION 1 CARRIES 40 MARKS THE**
OTHERS QUESTIONS CARRY 30 MARKS
EACH

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED
BY THE INVIGILATOR

SECTION A: COMPULSORY QUESTION

QUESTION 1

- a)
- (i) Discuss the emergence of very high-resolution (sub-meter) and 'superspectral' sensors in the 21st century. (8 marks)
 - (ii) Explain the challenges brought by these sensors in remote sensing. (12 marks)
- b) Define the following terms. (14 marks).
- (i) Conjugate (or corresponding) principal point
 - (ii) Electromagnetic spectrum
 - (iii) Focal length
 - (iv) Fiducial marks
 - (v) Nadir
 - (vi) Parallax
 - (vii) Photogrammetry
- c)
- (i) Define NDVI? (2 marks)
 - (ii) Explain the attribute of the vegetation to which NDVI is sensitive? (4 marks)
- (40 marks)**

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION 2

- a) Compare and contrast supervised and unsupervised classification? (12 marks)
 - b) Discuss the disadvantages of unsupervised classification. (10 marks)
 - c) Define penetration depth in remote sensing? (2 marks)
 - d) Explain the difference between brightness temperature and kinetic temperature? (3 marks)
 - e) State the meaning of a dispersive medium? (3 marks)
- (30 marks)**

QUESTION 3

- a) Discuss the issues to be considered in selecting a satellite image for solving any geographical problem. (20 marks)
- b) Briefly outline the difference between radiometric and spectral resolution. (10 marks)
- (30 marks)**

QUESTION 4

- a) 'At wavelengths shorter than $1\mu\text{m}$, snow and clouds have similar spectral signatures. In band 5 ($1.55\text{-}1.75\mu\text{m}$) of the Landsat Thematic Mapper, however, snow is dark while clouds are bright'.
- (i) Explain why, in terms of scattering principles. (6 marks)
- (ii) Explain why the normalized difference snow index (NDSI) discriminates snow from most other surface covers? (6 marks)
- i. Describe the basic steps in a hybrid supervised-unsupervised classification. (9 marks)
- ii. Briefly describe any three types of interaction mechanisms that occur between electromagnetic energy from the sun and the earth's surface. (9 marks)
- (30 marks)**

QUESTION 5

- a) Describe one modern hyperspectral satellite (sensor) in terms of:
- (i) its orbit, (3 marks)
- (ii) its swath, (3 marks)
- (iii) its repeat cycle and; (3 marks)
- (iv) the wavelength bands it senses. (12 marks)
- (v) Give examples of applications of the data from its sensor. (9 marks)
- (30 marks)**