



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF AGRICULTURE AND NATURAL RESOURCES MANAGEMENT

DEPARTMENT OF ENVIRONMENTAL STUDIES

THIRD YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF
ENVIRONMENTAL RESOURCE CONSERVATION

ENS 331: REMOTE SENSING FOR ENVIRONMENTAL MONITORING

DATE: 24/7/2017

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

Answer question one and two other questions

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- (a) Discuss the process of remote sensing (12 marks)
- (b) Explain the mechanism of radiation absorption in the atmosphere (8 marks)
- (c) A remote sensor equipped with a 120 mm focal length lens is used to take a vertical photo from a flying height of 2.78 km above mean sea level. Assuming that the terrain is flat and at an elevation of 380 m a.m.s.l, determine the following;
 - (i) The scale of the photo (3 marks)
 - (ii) The area at ground level of a rectangular field measuring 7.45 cm long and 3.33 cm wide on the same photo. (3 marks)
 - (iii) The number of Kei apple seedlings that will be required to fence around the field if spaced at 2 m. (2 marks)
 - (iv) The plant population if sorghum was to be planted at 35cm by 60 cm. (2 marks)

SECTION B: 40 MARKS (ANSWER ANY TWO QUESTIONS)

QUESTION TWO (20 MARKS)

- (a) Describe the mechanisms in which remote sensing data are transmitted to the earth surface. (6 marks)
- (b) Explain the mechanism which allows complete coverage of earth surface by a satellite. (6 marks)
- (c) Explain why images taken by passive microwave sensor are characterized by low spatial resolution. (8 marks)

QUESTION THREE (20 MARKS)

Explain the following facts;

- (a) Healthy plants appear greenish to our eyes (4 marks)
- (b) Satellites seem to be shifting towards westward direction (4 marks)
- (c) Fog appears whitish to our eyes (4 marks)
- (d) Ultra-violet and far infra-red radiation are not recorded by the commonly used sensors. (4 marks)
- (e) Areas in Greece are imaged more frequently than in Kenya. (4 marks)

QUESTION FOUR (20 MARKS)

- (a) Explain the multiple view approach of data collection in remote sensing (6 marks)
- (b) Describe the scattering mechanism of electromagnetic energy in the atmosphere (9 marks)
- (c) Calculate the range of digital numbers of a sensor with 6 bits radiometric resolution? (5 marks)

QUESTION FIVE (20 MARKS)

- (a) A camera equipped with a 152-mm focal-length lens and with an Instantaneous Field of View of 30° is used to take a vertical photo from a flying height of 2780 m above mean sea level. If the terrain is flat and located at an elevation of 500 m,
 - (i) What is the scale of the photo? (5 marks)
 - (ii) What is the resolution of the photo? (5 marks)
 - (iii) Calculate the ground resolution of the sensor (5 marks)
- (b) Calculate the frequency of electromagnetic radiation if its wavelength is 10^6 micrometres. (5 marks)