



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

EEE 548 ANTENNAS AND PROPAGATION

DATE: 26/10/2020

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS)

- a) Briefly describe antenna purpose. (3 marks)
- b) Explain lens antennas and where they are applicable. (6 marks)
- c) Explain models used to analyze diffraction effects where multiple edges exist. (4 marks)
- d) Discuss media properties that affect wave propagation (6 marks)
- e) In antenna arrays, explain what a Conformal array would be. (6 marks)
- f) Discuss antenna array variables. (5 marks)

QUESTION TWO (20 MARKS)

- a) With illustrations, explain how you make antenna gain measurements. (7 marks)
- b) Briefly discuss antenna types applicable at various parts of the radio frequency spectrum (6 marks)
- c) An antenna has a gain of 6 dB. Calculate its effective area. (6 marks)

QUESTION THREE (20 MARKS)

- a) Discuss characteristics of antenna. (6 marks)
- b) In a particular radio link operating at 15 GHz, the antenna specified is a parabolic dish of 40m diameter. Calculate antenna gain assuming aperture efficiency of 70%. (6 marks)

- c) Define axial ratio in a polarization ellipse. What will this axial ratio be in
- i. Circular polarization?
 - ii. Linear polarization? (8 marks)

QUESTION FOUR (20 MARKS)

- a) Discuss aperture antennas and their main characteristics and situations when you would use such antennas (6 marks)
- b) Explain with illustrations the causes and effects of refraction, diffraction, reflection, scattering and absorption as they affect radio wave propagation. (7 marks)
- c) Discuss leaky wave antennas and their application. (7 marks)

QUESTION FIVE (20 MARKS)

- a) Discuss when to use space diversity. (6 marks)
- b) Briefly discuss the general antenna classifications. (6 marks)
- c) Calculate the gain of a $15^\circ \times 15^\circ$ antenna. (8 marks)