MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 548 ANTENNAS AND PROPAGATION

DATE: 17/5/2019 **TIME: 8.30-10.30 AM**

INSTRUCTIONS:

Answer question and any other two questions

QUESTION ONE (30 MARKS)

a) Briefly describe antenna function. (2 marks)

b) There are various types of antennas. Name three used in laptop applications (6 marks)

c) Explain characteristics of an isotropic antenna, directional antenna and omnidirectional antenna and what they are used for? (6 marks)

d) Briefly discuss the propagations in the various segments of the radio frequency spectrum and applications (6 marks)

e) Define axial ratio and explain what it is in the following:- (2 marks)

i. Circular polarization (2 marks)

ii. Linear polarization (2 marks)

f) Discuss antenna arrays and their benefits (4 marks)

QUESTION TWO (20 MARKS)

a) Briefly demonstrate with illustration how you make antenna gain measurements (4 marks)

b) Explain the following showing relevance to electromagnetic wave power transfer

i. eirp.

ii. Antenna gain

iii. Reciprocity theorem as relates to antenna (6 marks)

c) Discuss atmospheric ducting and its effects in radio wave propagation (5 marks)

d) Explain four general classification of antennas (5 marks)

QUESTION THREE (20 MARKS)

a) Define pointing vector. (5 marks)

b) Explain Broadside and Endfire antenna arrays and their applications (5 marks)

c) Derive free space loss in dB where frequency is in MHz and distance is kilometers. (5 marks)

d) Discuss characteristics of a Uniform N- element linear antenna array. (5 marks)

QUESTION FOUR (20 MARKS)

a) Discuss reflector antennas and their main characteristics and situations when you would use such antennas . (4 marks)

b) In a particular radio link operating at 18 GHz, the antenna specified is a parabolic dish of 40m diameter. Calculate antenna gain assuming aperture efficiency of 70%. (6 marks)

c) Discuss factors affecting radio wave propagation (4 marks)

d) Discuss characteristics of a Uniform N- element linear antenna array. (6 marks)

QUESTION FIVE (20 MARKS)

a) Discuss the two diversity techniques and their effectiveness. (5 marks)

b) Briefly discuss antenna characteristics and how they relate to transmitting and receiving functions. (5 marks)

c) Explain using calculations the gain of a 30x30 deg^2 antenna. (5 marks)

d) Discuss leaky wave antennas and their application (5 marks)