MACHAKOS UNIVERSITY

University Examinations for 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRONIC ENGINEERING)

EEE 548 ANTENNAS AND PROPAGATION

DATE: **TIME:**

INSTRUCTIONS ***Answer questions One and any other Two Questions. Question One is Compulsory and carries 30 Marks. The remaining questions carry 20 Marks each.***

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Compare an antenna to a transmission line. (3 marks)

b) Discuss the following types of antennas:-

i) lens antenna
ii) Leaky wave antennas
iii) Reflector antennas (6 marks)

c) What are the characteristics of an isotropic antenna and what is it used for? (4 marks)

d) Discuss media properties that affect radio wave propagation (6 marks)

e) Discuss characteristics of Uniform N-Element Linear Array (6 marks)

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f) Discuss antenna arrays and their purpose (5 marks)

QUESTION TWO (20 MARKS)

a) Briefly demonstrate with illustration how you make antenna gain measurements (6 marks)

b) Briefly discuss the radio frequency propagation and antenna systems applicable at the various parts of the radio frequency spectrum (7 marks)

c) An antenna has a gain of 12dB. Calculate its effective area. (7 marks)

QUESTION THREE (20 MARKS)

a) Define pointing vector. (6 marks)

b) Discuss polarization ellipse and the characteristics that define it. (8 marks)

c) Discuss atmospheric factors affecting radio wave propagation (6 marks)

QUESTION FOUR (20 MARKS)

a) Discuss reflector 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) Explain the general antenna classification (7 marks)

QUESTION FIVE (20 MARKS)

a) Discuss two common diversity techniques and their effectiveness. (6 marks)

b) Briefly discuss antenna characteristics and how they relate to transmitting and receiving functions. (6 marks)

Calculate the gain of a 15^0 X 15^0 deg^2 antenna. (8 marks)