



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 553 RADIO COMMUNICATION ENGINEERING

DATE: 19/10/2020

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS)

- a) Discuss radiofrequency wave propagation in the various parts of the spectrum and their application. (5 marks)
- b) Briefly discuss losses in a radio communications system (4 marks)
- c) With illustration show the necessary features of outside broadcasting (4 marks)
- d) Derive the free space loss (FSL) equation as used in radio communication engineering. (4 marks)
- e) Explain diffraction effects in radio wave propagation. (4 marks)
- f) Discuss the factors leading to radio signal fading and mitigation measures. (4 marks)
- g) TV broadcasting has recently become digital in what is known as digital migration. What are the advantages achieved in the digital migration? (5 marks)

QUESTION TWO (20 MARKS)

- a) A 60km radio link across a reasonably level terrain is to use 6 GHz frequency and 1.8m dish antennas. Determine the following: -
 - i. Minimum antenna heights on the link (4 marks)
 - ii. Free space loss on the link (4 marks)

- iii. Power at the receiver if the transmitter power is 5watts. (4 marks)
- b) In the radiofrequency spectrum, explain where you will find the following services giving supporting reasons
 - i. FM radio broadcasting
 - ii. TV broadcasting
 - iii. Mobile telephone services
 - iv. Shortwave radio broadcasting (4 marks)
- c) In designing a radio link, explain the important steps you would take to arrive at reliable radio link. (4 marks)

QUESTION THREE (20 MARKS)

- a) With illustrations, describe the over the horizon wave propagation. (5 marks)
- b) Explain the medium properties which affect radio wave propagation (5 marks)
- c) An engineer is designing a radio link where the terrain is reasonably level. Discuss the likely problems with this link and measures to mitigate them. (6 marks)
- d) Explain FM radio broadcasting frequency band available to Kenya, giving the lowest, the highest and any other two frequencies in use. (4 marks)

QUESTION FOUR (20 MARKS)

- a) You are planning a high capacity radio link across a 60km path. Discuss the steps you will follow to realize this radio link. (7 marks)
- b) You are to assist an investor to establish a TV broadcast in Kenya. Discuss the steps you will take to implement the system (7 marks)
- c) Explain the various propagation losses occurring in a terrestrial radio link. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain with illustration the application Fresnel zone clearance in radio systems engineering (7 marks)
- b) In a radio system, discuss methods which you can employ to increase channel capacity given a transmit and receive frequencies (6 marks)
- c) Discuss methods to estimate diffraction loss from 2 edges in a radio path (7 marks)