



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FIFTH YEAR SECOND SEMESTER EXAMINATIONS FOR

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

EEE 553 RADIO COMMUNICATION ENGINEERING

DATE: 15/12/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer questions One and any other Two Questions. Question One is Compulsory and carries 30 Marks. Other questions carry 20marks each.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain the signal degradation occurring in radiofrequency propagation (6 marks)
- b) Describe briefly the 4 basic building blocks of radio communication. (6 marks)
- c) In a radio link where you expect multipath fading, discuss how you will mitigate this problem in your design of the radio link. (6 marks)
- d) Derive free space loss equation and show fsl in dB where frequency is in MHz .and distance is in km. (6 marks)
- e) In radio broadcasting, explain the three main systems in use in this country, giving their characteristics, applications, advantages and disadvantages. (6 marks)

QUESTION TWO (20 MARKS)

- a) Discuss radiofrequency wave propagation in the various parts of the spectrum (5 marks)

- b) In a particular radio system, the transmitter output is 13W. If it uses an antenna of 48dB gain, calculate the effective power transmitted in the direction of maximum antenna gain. (5 marks)
- c) TV broadcasting has recently become digital in what is known as digital migration. What are the advantages achieved in the digital migration. (5 marks)
- d) Discuss with illustrations the essential characteristics of a broadcasting antenna and how they are achieved... (5 marks)

QUESTION THREE (20 MARKS)

- a) Describe with illustrations the ground wave propagation. (6 marks)
- b) Discuss wave polarization as occurring in radiofrequency propagation (7 marks)
- c) Briefly explain the important steps in the design of a radio link. (7 marks)

QUESTION FOUR (20 MARKS)

- a) Briefly explain the phenomena of atmospheric absorption in radiofrequency propagation. (5 marks)
- b) Discuss Bullington method to estimate diffraction loss from multiple edges, in this case 2 edges. (4 marks)
- c) Distinguish gain of an antenna from that of an amplifier. (5 marks)
- d) Explain how sky wave radio propagation is influenced by the ionosphere. (6 marks)

QUESTION FIVE (20 MARKS)

- a) A radio system requires a 1.5m dish antenna. Calculate the gain of this antenna operating at 2GHZ. (4 marks)
- b) You are required to design a high capacity radio system between two stations A and B 40 km apart between which there are buildings and trees and line of sight is just possible. Briefly discuss with illustrations and calculations the considerations you will make so as to deliver a properly functioning system. Assume you will use 2GHz. (6 marks)
- c) Briefly explain with illustrations non line of sight radio wave propagation. (5 marks)
- d) Give a brief explanation on how you would prepare a radio link path profile (5 marks)