



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

**FIFTH YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN
ELECTRICAL AND ELECTRONICS ENGINEERING**

EEE 509: WIRELESS COMMUNICATION

DATE: 1/8/2017

TIME:2 HRS

INSTRUCTIONS

Answer Question one and any other two questions

QUESTION ONE (30MARKS)

- a) Describe briefly the trend involved in wireless communication (3 marks)
- b) Explain the term frequency re-use as it is used in cellular communication (2 marks)
- c) Define the core function of mobile switch (MS) and base station BS (2 marks)
- d) Explain the three techniques used in increasing cellular system capacity (3 marks)
- e) Distinguish between blocked call cleared and blocked call delayed in cellular system (2 marks)
- f) State various propagation models mechanism for electromagnetic waves and its significance (3 marks)
- g) Outline the advantages and disadvantages of Okumura and Hata models (3 marks)
- h) Differentiate between macro and micro diversity (2 marks)
- i) Describe briefly various factors that influence the digital modulation (3 marks)
- j) Explain the following terms: jamming; jamming margin and anti-jamming (3 marks)
- k) Discuss about 3G standards – WCDMA/UMTS for wireless network (4 marks)

QUESTION TWO (20MARKS)

- a) Explain the cause of *Inter symbol Interference* and how is it eliminated (4 marks)
- b) Discuss briefly about the requirements of services for a wireless system. (4 marks)
- c) Describe the technical challenges to wireless communication (4 marks)
- d) Derive the expression for electric field, path loss and received power for a Two Ray model (8 marks)

QUESTION THREE (20MARKS)

- a) Discuss four techniques used in improving coverage and capacity in cellular systems (8 marks)
- b) With an aid of diagram, explain TDMA and FDMA (8 marks)
- c) A receiver is 6km away from an 80 W transmitter. If the carrier frequency is 1600MHz, antenna gain at transmitter and receivers is 2.5 and 5 respectively. Calculate (4 marks)
 - i. Power received at the receiver
 - ii. The magnitude of the E-field at the receiver of the antenna.
 - iii. The rms voltage applied to the receiver input .The receiver antenna voltage has 100Ω impedance and is matched to the receiver. Assume the transmitter and the receiver is modeled in free space propagation.

QUESTION FOUR (20MARKS)

- a) Explain in detail the generation of GMSK modulation (6 marks)
- b) Explain four different methods of micro diversity in detail (8 marks)
- c) Explain the principles of Frequency Hopping spread spectrum technique and direct- sequence spread spectrum technique. (6 marks)

QUESTION FIVE (20MARKS)

- a) Explain the principle of IS-95 for wireless communication hence describe the forward & reverse channel parameters of IS-95 CDMA (7 marks)
- b) Explain the operations of orthogonal frequency division multiplexing and define and list the benefits of cyclic prefix cyclic prefix. (5 marks)
- c) Explain the detail of maximum like hood sequence estimation (MLSE) of Nonlinear equalizer (5 marks)
- d) Describe the major goal of GSM standard hence highlight various services offered by GSM (3 marks)