



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
MAY INTAKE SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE

SPH 104: INTRODUCTION TO TELECOMMUNICATIONS

DATE: WEDNESDAY 3RD AUGUST 2011

TIME: 8.00 A.M -10.00 A.M

INSTRUCTIONS

Answer Question ONE and ANY other TWO questions. Question ONE carries 30(thirty) marks whereas the Other Questions carry 20 Marks each.

- Q1. a) Explain briefly what you understand by the following terms:
- i) Telecommunications
 - ii) Encoder
 - iii) Multiplexer (3 marks)
- b) State and describe the two main resources in a communication system (3 marks)
- c) Why is a high frequency carrier needed in communication systems (3 marks)
- d) State and briefly explain the six communication process (3marks)
- e) With the help of a diagram ,describe the components of a communication network (3 marks)
- f) Explain the need for modulation in a communication system (3 marks)
- g) Explain why ionospheric communication depends on the time of the day and season .Mention any other periodic effects if any (3 marks)
- h) With the aid of a diagram describe and explain the operation of a PSTN network (3 marks)
- i) Write the general expression of an ac voltage and describe the various parameters used to illustrate an alternating signal

- (3 marks)
- j) Explain the difference between base band transmission and band pass transmission (3 marks)
- Q2. a) A carrier is frequency modulated by a 4KHz sine wave resulting in an FM signal having frequency of 102.6MHz and a maximum frequency of 102.196MHz
- i. Find the carrier swing
 - ii. Calculate the carrier frequency
 - iii. What is the frequency deviation of the FM signal?
 - iv. Determine the modulation index
- (8 marks)
- b) Define the following terms as used in cellular networks
- i. Cell
 - ii. Foot print
 - iii. Frequency reuse
- (6 marks)
- c) If a total of 33MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 20KHz simplex channels .Compute the number of channels available per cell if the system uses:
- i. 4 cell reuse
 - ii. 6 cell reuse
 - iii. 9 cell reuse
- (6 marks)
- Q3. a) Explain the three categories of communication listed below citing an example in each case.
- i. Simplex
 - ii. Half duplex
 - iii. Full duplex
- (6 marks)
- b) A bandwidth of 12MHz becomes available for assignment . If assigned for TV broadcast service ,only two channels could be accommodated . Determine the number of AM stations that could broadcast simultaneously if the maximum modulating frequency is limited to 5KHz
- (8 marks)
- c) List the basic functions of a radio transmitter and the corresponding functions of the receiver (6 marks)

- Q4. a) Write the expression for an AM wave and cite:
- The envelope
 - The bandwidth for the AM wave
- (6 marks)
- b) Find the per-cent modulation of an AM wave whose total power content is 2500W and whose sidebands each contains 400W
- (3 marks)
- c) i) Derive the relation between the output power of an AM transmitter and the depth of modulation, and plot it as a graph for values of the modulation index from zero to maximum
- (8 marks)
- (ii) A transmitter radiates 9 kW with the carrier unmodulated and 10.125kW when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave corresponding to 40 percent modulation is transmitted simultaneously , determine the total radiated power
- (3 marks)
- Q5. (a) (i) Cite the merits and de-merits of digital communication
- (3 marks)
- (ii) Show that an FM signal is given by the expression $S(t) = A_c \cos [2\pi f_c t + B \sin(2\pi f_m t)]$ and state the meaning of different quantities
- (6 marks)
- (iii) With the aid of a block diagram describe how wideband FM signal may be generated using indirect method
- (4 marks)
- (b) (i) State any SIX advantages of modulation
- (3 marks)
- (ii) Define the term modulation depth
- (2 marks)
- (iii) Define frequency spectrum
- (2 marks)