



TECHNICAL UNIVERSITY OF MOMBASA
School of Engineering & Technology
DEPARTMENT OF MEDICAL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN MEDICAL ENGINEERING
TMD 4409: TELEMEDICINE
 END OF SEMESTER EXAMINATIONS
 SERIES: AUGUST 2024
TIME: 2 Hours
DATE: AUGUST 2024

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Answer Question ONE and any other TWO questions.

Do not write on the question paper.

Question ONE (Compulsory 20 marks)

- (a) (i) Describe telemedicine. **(2 marks)**
 (ii) Draw a block diagram of a simple telemedicine system **(6 marks)**
 (iii) Describe the functions of each block. **(6 marks)**
- (b) A Sinusoidal modulating signal, $m(t) = 4\cos 2\pi 4 \times 10^3 t$ is applied to an FM modulation that has a frequency deviation constant gain of 10kHz/V. Compute: **(6 marks)**
- i) The peak frequency deviation
 ii) The modulation index

Question TWO

- (a) (i) Describe with relevant diagrams FDMA and TDMA technologies as applied in wireless communication systems
 (ii) Highlight TWO factors that determine the choice of modulation scheme
 (iii) State ONE application of each of the modulation schemes. **(12 marks)**
- (b) (i) Draw the basic block diagram of GSM
 (ii) List the TWO types of services provided by GSM. **(8 marks)**

QUESTION THREE

- a) i) Explain the meaning of the term **super-heterodyning** as used in modern receivers
ii) Explain any TWO advantages of employing super heterodyning in receivers **(4 marks)**

- b) Given that the amplitude modulated wave is given by;

$$v_{AM}(t) = V_c(1 + m \cos \omega_s t) \cos \omega_c t$$

where V_c is the peak carrier voltage and ω_c is the angular frequency of the carrier, m is the modulation index, ω_s is the modulating signal angular frequency, Show that the ratio of sideband power to the total power of AM signal is given by:

$$\frac{m^2}{2 + m^2}$$

(5 marks)

- c) Draw the circuit of an A.M detector and explain its operation

(6 marks)

- d) An AM transmitter has an output of 36kW when modulated to a depth of 100%. Determine the

- i) power of the un-modulated carrier
ii) the power output when after modulation to a depth of 60% one sideband is suppressed

(5 marks)

Question FOUR

- (a) (i) Explain wireless network topology.
(ii) State and describe the TWO network topologies. **(5 marks)**

- (b) Consider simple LAN and WLAN

- (i) Differentiate between the two
(ii) State and explain TWO advantages and TWO disadvantages as compared to LAN. **(11 marks)**

- (c) (i) Describe Bluetooth

- (ii) State TWO key features of Blue tooth. **(4 marks)**

QUESTION FIVE

- (a) Describe any FIVE Parameters of an Aerial. **(10 marks)**

- (b) Draw a well label diagram of a Yagi Aerial and state the function of each of its elements. **(7 marks)**

- (c) For the aerial in (b), calculate the length of the Dipole if it is used to tune a Radio Channel operating at a Frequency of 300 MHz. **(3 marks)**

