



UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER TWO EXAMINATIONS
ACADEMIC YEAR 2024/2025

DEPARTMENT: ICT

SEMESTER: TWO

PROGRAMME(S): DIPLOMA IN ELECTRONICS AND COMMUNICATIONS ENGINEERING(DECE)

YEAR OF STUDY: TWO

COURSE: INTRODUCTION TO MICROWAVE COMMUNICATION

COURSE CODE : ECE224

DATE: FRIDAY 20TH JUNE 2025

TIME: 2PM- 5PM

DURATION: 3 HOURS

INSTRUCTIONS:

- (i) This paper contains two Sections: A (40 marks) & B (60 marks).**
- (ii) Attempt ALL questions in Section A, and ONLY THREE questions in Section B.**
- (iii) All questions in Section B carry equal marks.**
- (iv) Credit will be given for use of relevant examples and illustrations.**
- (v) Begin each number in Section B on a new page of the answer sheet.**
- (vi) DO NOT write on this question paper**

SECTION A

1. The frequency range of Microwave frequencies is
 - a) 300MHz-3000MHz
 - b) 30MHz-300MHz
 - c) 3MHz – 30MHz
 - d) 30THz-3000Hz
2. One of the reasons why vacuum tubes eventually fail at microwave frequencies is that their
 - a) Transmit time becomes short
 - b) noise figure increases
 - c) shunt capacitive reactance becomes too large
 - d) series inductive reactance becomes too small
3. In microwave communication links, when fading due to rain attenuation occurs, the techniques adopted for solving the problem would include.
 - a) Antenna replacement and feed correction
 - b) amplitude trimming and phase correction
 - c) Polarization shifting and code diversity
 - d) path diversity and frequency diversity
4. Ionospheric propagation is not possible for microwave because
 - a) Microwaves will be fully absorbed by the ionospheric layers
 - b) there will be an abrupt scattering in all direction
 - c) microwaves will penetrate through the ionospheric layers
 - d) there will be dispersion of microwave energy
5. Which polarization is suitable for ground wave propagation
 - a) Vertical polarization
 - b) horizontal polarization
 - c) circular polarization
 - d) elliptical polarization
6. A yagi antenna is a directional antenna consisting of parasitic elements called
 - a) Only a Director
 - b) with a reflector
 - c) with one or two more directors
 - d) with a reflector and one or more directors
7. The antenna which provides circularly polarized waves is
 - a) Helical Antenna
 - b) Yagi- Uda Antenna
 - c) Small Circular loop Antenna
 - d) Parabolic Reflector Antenna
8. Which of the following is NOT true with respect to antennas
 - a) Lower frequencies are radiated near the end of the line
 - b) Horn antennas are used to feed parabolic dish antennas
 - c) Higher frequencies are radiated near feed point
 - d) Yagi-Uda have high band width and low gain

9. To make the antenna more directional either its size must be increased or-
- The number of its feed horns must be increased
 - The frequency of its transmission must be increased
 - Its foot print must be increased
 - Its effective isotropic radiated power must be increased
10. The antenna employed in smart phones for cellular network
- Patch antenna
 - Planar MIMO antenna
 - Plasma Antenna
 - Horn Antenna
11. State two applications examples of microwave frequencies under the following categories
- Communication **2marks**
 - Radar **2 marks**
 - Remote sensing **2 marks**
 - Heating **2 marks**

12. KCCA installed cameras to monitor traffic, these cameras rely on wireless transmission to relay information to the Operation Centre using the microwave free license band. What is the disadvantage and risk involved? **2 marks**

Question 13

- What is the role of UCC in regards to telecommunication **2marks**
- State two intentional standardization bodies **2 marks**
- Explain the following ways of propagation of electromagnetic waves and state one application for each **(6 marks)**
 - Ground wave propagation
 - Sky wave propagation

Question 14

- Define Fresnel zone as applied in microwave propagation. **1 mark**
- What is reflection **1 mark**
- Calculate the wavelength(cm) in free space for the following microwave frequencies:
 - 380 MHz
 - 270 GHz **[2 marks @] 4 marks**

d) Explain the following transmission limitations

[1 marks @]

4marks

- (i) Attenuation
- (ii) Dispersion
- (iii) Distortion
- (iv) Noise

SECTION B [60 MARKS]

Attempt **ONLY THREE** Questions in this Section.

Question 15

- a) What is a radome 2 marks
- b) How does the Iron dome defense system of Israelis work 3 marks
- c) Radar systems are crucial for national defense, state four functions of radars 4 marks
- d) Explain what you understand by Doppler Effect and state the type of radars that use Doppler effect 4 marks
- e) State the Basic principle of operation of a Traffic Speed gun 7 marks

Question 16

- a) Starlink applied to UCC to start operating as an internet provide. Explain how a phone can access internet through a satellite 3 marks
- b) Uganda launched a satellite, what is its name and intended use 3 marks
- c) State the reason for different uplink and downlink frequencies in satellite transmission 3 marks
- d) They are 3 Kepler laws of planetary motions, highlight 3 important phenomenal issues described these laws or state them 3 marks
- e) State 2 types of Orbits and the type satellites commonly used in those orbit 4 marks
- f) What do you understand by FDMA and TDMA 4 marks

Question 16

- a) Describe **four** factors that limit the use of a vacuum tube at microwave frequencies. 8marks
- b) Give **two** reasons why microwave tubes may be preferred over solid-state devices. 4 marks
- c) Describe how a Klystron tube works/ operates. 8 marks

Question 17

- a) State the transmission medium of transmitting the following frequencies and why
 - i. 50Hz
 - ii. 60GHZ 2marks]@ 4 marks
- b) State the procedure for carrying out a site survey 10 marks
- c) Why is impedance matching necessary in antennas 4 marks
- d) Within the microwave frequency range which frequencies (band) are suitable for very high bandwidth application and why? 2 marks

Question 19

- a) What is link budget analysis 3 marks
- b) State 3 factors considered in microwave planning 3 marks
- c) Explain the following types of fading (2 marks each) 8 marks
 - i. Multi path fading
 - ii. Flat fading
 - iii. Frequency Selective Fading

iv. Rain Fading

- d) A telecom company wants to extend its network coverage to Sese Islands. Preliminary survey and link budget analysis greatly highlight a signal loss on link over Lake Victoria. Explain a redundancy technique that can be used to solve the problem **6 marks**

END