



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRONICS ENGINEERING

EEE415- ELECTRONIC COMMUNICATION SYSTEM 1

FINAL EXAMINATION – TRIMESTER 2, 2015

DAY/DATE: TIME: ROOM: As per Timetable.

INSTRUCTIONS TO STUDENTS

1. *You are allowed 10 minutes Extra reading time during which you are NOT to write.*
2. *Begin each answer on a fresh page and use both sides of the sheet.*
3. *Write your candidate-number at the top of each attached sheet*
4. *Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string*
5. *For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.*
6. *Write clearly the number(s) of the question(s) attempted on the top of each sheet.*
7. **ANSWER ALL QUESTIONS.**
8. *Show all workings where necessary.*
9. *Do not use programmable calculators, especially the ones that does the conversions of number systems.*
10. ***ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!***

SECTION A**MULTIPLE CHOICE****[15 MARKS]**

Choose the appropriate answer from each question by writing the alphabet beside the question number:

1. What is the frequency range of Super High Frequency
 - A. 30 – 300MHz
 - B. 300 – 3000MHz
 - C. 3 – 30GHz
 - D. 30 – 300GHz

2. What do we call an equipment that houses the transmitter and the receiver
 - A. Transducer
 - B. Transceiver
 - C. Radio Telephone
 - D. Fax

3. What is phase modulation?
 - A. Signal amplitude is constant, phase varies
 - B. Phase is constant, amplitude varies
 - C. Both amplitude and phase varies
 - D. Both amplitude and phase remain the same

4. Natural and Internal noise sources may be minimized by
 - A. Closing the whole surrounding for noise not to enter
 - B. Buying expensive products
 - C. Appropriate frequency, good system with good antenna design
 - D. All of the above

5. The off-hook condition on the subscriber line is when
 - A. the exchange identify that the subscriber has completed the call
 - B. The exchange notices the subscriber has lifted the phone and provides dial tone
 - C. The exchange will hold the line before it can be transferred to another subscriber
 - D. All of the above

6. Which is an advantage of optical communication links over using transmission lines or waveguides?
 - A. Small size
 - B. Extremely wide bandwidths
 - C. Lower cost
 - D. All the above

7. Name the antenna used to generate circular polarization.
 - A. Helix
 - B. Rod
 - C. Loop
 - D. Slot

8. The most common light used in fiber-optic links is.
- A. Infra-red
 - B. Red
 - C. Violet
 - D. Ultra violet
9. Fiber optic technology is used in applications of.
- A. Local area networks
 - B. Cable TV (CATV) systems
 - C. Telephone networks
 - D. All the above
10. Which term applies to the lowest point of the satellite while orbiting earth?
- A. Apogee
 - B. Perigee
 - C. Ascending node
 - D. Inclination
11. What is a multiplexer?
- A. One input and several outputs
 - B. Several inputs and one output
 - C. Several inputs and outputs
 - D. One input and one output
12. A **piconet** might cover.
- A. Fast moving mobile on cars
 - B. those in the outer islands
 - C. slow moving people between large buildings
 - D. an individual lobby or the floor of a convention center
13. One disadvantage of optical fibre is:
- A. Light weight
 - B. Non-conductive
 - C. Very difficult to tap into the optical fibre to read the data signals
 - D. Very expensive to maintain the cables
14. Which type of modulation is found in encoders?
- A. PAM
 - B. PWM
 - C. PPM
 - D. PCM

- 15 In satellite communication, a repeater located on the satellite is known as:
- A. Transponder
 - B. Tracking
 - C. Polar orbit
 - D. Uplink

SECTION B

[15 MARKS]

Write either **TRUE** or **FALSE** for the correct answer.

1. In Pulse amplitude modulation, the pulse amplitude is made proportional to the modulating signal's amplitude.
2. Each base station uses carefully chosen frequencies to reduce interference with neighboring cells. Narrowly directed sites cover tunnels, subways and specific roadways. The area served depends on:
 - Topography,
 - Population, and
 - Traffic.
3. Pulse duration modulation are designation for a single type of modulation.
4. Each call is divided on a single frequency by time in FDMA.
5. Different calls are placed on different frequencies in TDMA.
6. The greatest drawback in CDMA is that it can use all cellular frequencies in every cell.
7. Sampling theory states that to convert an analogue signal to a digital form it must first be band – limited then sampled.
8. One of the disadvantages of polar orbits is that they provide global coverage, necessary for climate studies.
9. Downlink is the transmission of signals from a satellite to an earth station.
10. Uplink is the transmission of signals from an earth station to a satellite.
11. Azimuth angle and elevation look angles are jointly referred to as the antenna look angles.
12. The area a base station covers is called a cell site.
13. Why a hexagon and not a circle to represent cells because hexagon will cover all spaces
14. Cross-link is the term that relates to the communication between two transponders.

15.._If you have frequency reuse you have no cellular.

SECTION C

FILL IN THE BLANKS

[20 MARKS]

Choose the correct answer from the list by writing the answer against your question number in your answer booklet:

multimode; demodulator; 16; 32; fibre optics; light, current, voltage; wide, communication; more; amplitude, frequency; satellite, microwave; single; antenna; directivity; FADING; dielectric; wavelength; apogee; PAM; Reflection; transducer; *station class mark (SCM)*

1. _____ occurs when radio waves are “bounced” from a flat surface
2. The most troublesome and frustrating problem in receiving radio signals is variations in signal strength, most commonly known as _____
3. A _____ mode fibre supports one propagating mode.
4. A _____ is a device, usually electrical, electronic, electro-mechanical, electromagnetic, photonic, or photovoltaic that converts one type of energy or physical attribute to another for various purposes including measurement or information transfer (for example, pressure sensors).
5. Inter-modal dispersion contributes largely to pulse spreading in _____ fibers.
6. _____ and _____ links have the similar tasks but they differ in their propagation.
7. The idea of fibre optics is to use _____ instead of _____ or _____ as the energy that carries the data.
8. An added advantage in using fibre optics is that it can handle _____ band channel of _____
9. Most antennas consist of a conductor and insulator, which may be _____ or it may be air.
10. _____ is the distance between successive crests of a wave.
11. A multimode fibre supports _____ than one propagating mode.
12. In a _____ level code (PCM) each decimal number is represented by a series of 4 binary digits.
13. In a _____ level code (PCM) each decimal number is represented by a series of 5 binary digits.
14. Quantization is used mostly in _____ and _____ modulated pulse systems.
15. In PCM _____ will reproduce the correct standard amplitude represented by the pulse-code group.
16. _____ is a figure of merit for an antenna.

17. _____ is a device that transmits or receives electromagnetic waves.
18. _____ is the simplest pulse modulation to create.
19. The mobile phone also has a number called the _____ which identifies its maximum transmitter power level.
20. The point of highest altitude is called _____

SECTION D

[50 MARKS]

- 1) Many factors can affect atmospheric conditions, either positively or negatively. Three of these are variations in geographic height, differences in geographic location, and changes in time (day, night, season, and year). The earth's atmosphere is divided into three separate regions or layers. They are troposphere, stratosphere and ionosphere. Describe these three types of layers. **(3 marks)**
- 2) A radio wave transmitted into ionized layers is always refracted, or bent. This bending of a radio wave is called refraction. As the wave enters the denser layer of charged ions, its upper portion moves faster than its lower portion. The abrupt speed increase of the upper part of the wave causes it to bend back toward the earth. This bending is always toward the propagation medium where the radio wave's velocity is the least. Name the three main factors on which the amount of refraction of a radio wave undergoes. **(3 marks)**
- 3) Define the following terms:
- a) Bandwidth **(1mark)**
 - b) Transceiver **(1 mark)**
 - c) Selectivity **(1 mark)**
- 4) Radio receivers tuned to any frequency for communication are subject to interference from three external noise sources. Name the three external noise sources. **(3 marks)**
- 5) Modulation is the process of varying some characteristics of a periodic wave with an external signals. Modulation is utilized to send an information bearing signal over long distances. Explain amplitude modulation and frequency modulation with the waveforms. **(6 marks)**
- 6) Each cell site's radio base station uses a computerized transceiver with an antenna to provide coverage. Name the three things on which the area served depends on? **(3 marks)**

- 7) A super heterodyne receiver (often shortened to superhet) uses frequency mixing to convert a received signal to a fixed intermediate frequency (IF) which can be more conveniently processed than the original radio carrier frequency. Virtually all modern radio receivers use the superheterodyne principle. At the cost of an extra frequency converter stage, the superheterodyne receiver provides superior selectivity and sensitivity compared with simpler designs. Draw and label the block diagram of the super heterodyne receiver. **(4 marks)**
- 8) Explain the operation of a private automatic branch exchange (PABX). **(2 marks)**
- 9) Digital and analog systems are the two ways to display, store or manipulate information. Explain these two systems. **(2 marks)**
- 10) Draw a Yagi-Yuda antenna with a reflector, driven element, directors and boom. **(4 marks)**
- 11) Calculate the length of a half wave dipole if the transmitting frequency is 98.0 MHz? **(2 marks)**
- 12) FM receiver has the capacity to demodulate a signal that was frequency modulated. With FM, the center frequency of the carrier is skewed up and down in synchrony by the signal used to modulate it. Draw and label the block diagram of the FM receiver. **(9 marks)**
- 13) List three characteristics of Log periodic Antenna. **(1.5 marks)**
- 14) Fiber optic communication is a method of transmitting information from one place to another by sending pulses of light through an optical fiber. Name the three main parts of an optical fiber. **(1.5 marks)**
- 15) The number of bit per baud is determined by the modulation technique used. Explain the difference between bit rate and baud rate. **(3 marks)**

*****THE END*****