



COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRONICS ENGINEERING - STAGE 4

UNIT CODE: EEE420

TITLE: ELECTRONIC COMMUNICATIONS SYSTEMS 2

FINAL EXAMINATION – PENSTER 4, 2013

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 SECTION 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 a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

SECTION A

[40 MARKS]

- 1) An antenna is a device designed to transmit or receive electromagnetic energy, matching these sources of energy and the space. Also often called radiant systems. Describe the following types of antennas.
- a) Dielectric rod antennas **(1 marks)**
 - b) Transmission line antennas **(1 marks)**
 - c) Array antennas **(1 marks)**
- 2) Recent advances in the development and manufacture of fiber-optical systems have made them the latest frontier in the field of telecommunications. They are being used extensively for both military and commercial data links and have replaced a lot of copper wire. They have also taken over almost all the point-to-point long-distance communication traffic previously handled by microwave and satellite links, particularly transoceanic. Draw the system diagram of an optical link and label all the parts. **(5 marks)**
- 3) A mobile phone (also known as a cellular phone, cell phone, and a hand phone) is a device that can make and receive telephone calls over a radio link while moving around a wide geographic area. Describe the difference between GSM and CDMA types of cellular phones. Give one application each. **(2.5 marks)**
- 4) A satellite dish is a dish-shaped type of parabolic antenna designed to receive microwaves from communications satellites, which transmit data transmissions or broadcasts, such as satellite television. Explain the following types of satellite dish.
- a) Motor driven dish **(2 marks)**
 - b) Multi satellite dish **(2 marks)**
- 5) Telecommunication in the 21st century have improved over the decade by the introduction of better techniques through which signals can be transmitted from a transmitter through a medium to a receiver. Some of these techniques are amplitude modulation and frequency modulation. Describe pulse duration modulation, pulse position modulation and pulse frequency modulation. **(6 marks)**
- 6) Pulse code modulation has been a form used for some compact disc formats, digital video and for digital audio in computers. Name the five series of processed to be followed in PCM. **(2.5 marks)**

7) Transmission means sending information on electricity or light from one point to another. Voice or data makes up the transmission. Explain the three ways of transmitting information using wireless system. **(3 marks)**

8) A transponder consists of a number of electronic components onboard the satellite. They work together to create an RF communications channel of a standard bandwidth. Draw and label the block diagram of Satellite uplink & downlink transponder. **(9 marks)**

9) Define the following:

- a) Uplink **(1 mark)**
- b) Downlink **(1 mark)**
- c) Sampling frequency **(1 mark)**
- d) Geostationary orbit **(1 mark)**
- e) Station keeping **(1 mark)**

SECTION B

[15 MARKS]

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

1. Perigee is the lowest point of the satellite while orbiting earth.
2. The azimuth angle varies from 0 to 360 degrees, allowing you to look in every horizontal direction.
3. The two ways to display, store or manipulate information is by digital and analog systems.
4. Characters per second is often the bottom line in rating data transmission speed and a more convenient way of thinking about data transfer than baud or bit rate.
5. To convert an analogue signal to a digital form it must first be band-limited then sampled.
6. The greatest drawback in CDMA is that it can use all cellular frequencies in every cell.
7. Polar orbit is the satellite's orbit in parallel with the sun's orbit.
8. Multiplexing is the demodulation of a scrambled information.
9. Demultiplexing is the recombination of coded information.
10. In analog cellular where FDM is used calls are separated by space.
11. In PPM the amplitude and width of the pulse is not kept constant in the system.
12. Filtering is the process where frequencies above the highest signal frequency are removed.
13. Each call is divided on a single frequency by time in FDMA.
14. Cross-link is the term that relates to the communication between two transponders.
15. Different calls are placed on different frequencies in TDMA.

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:

azimuth, elevation, multimode fibers, demodulator, one, $v = f\lambda$, communication, 16, 32, fibre optics, light, current, voltage, wide, communication, transverse, more, amplitude, frequency, satellite, microwave, difficult

1. Any antenna having a physical length that is one - half wavelength of the applied frequency is called a hertz antenna and this relationship is governed by a formula _____.
2. The propagating wave has a _____ direction for the electric field called the polarisation direction.
3. _____ and _____ links have the similar tasks but they differ in their propagation.
4. The idea of fibre optics is to use _____ instead of _____ or _____ as the energy that carries the data.
5. An added advantage in using fibre optics is that it can handle _____ band channel of _____.
6. A single-mode fibre supports _____ propagating mode.
7. Inter-modal dispersion contributes largely to pulse spreading in _____.
8. A multimode fibre supports _____ than one propagating mode.
9. In a _____ level code (PCM) each decimal number is represented by a series of 4 binary digits.
10. In a _____ level code (PCM) each decimal number is represented by a series of 5 binary digits.
11. Quantization is used mostly in _____ and _____ modulated pulse systems.
12. In PCM _____ will reproduce the correct standard amplitude represented by the pulse-code group.
13. It is easy to strip and join wires but for optic fiber, it is _____ to terminate or join.
14. _____ angle and _____ look angles are jointly referred to as the antenna look angles.

SECTION D

[25 MARKS]

- 1) How long does an electromagnetic wave take:
- i) to travel 400,000 miles in space? **(2 marks)**
 - ii) to travel 6×10^6 meters in space? **(2 marks)**
- 2) Calculate the length of a half wave dipole if the transmitting frequency is 98.0 MHz? **(2 marks)**
- 3) Draw modulating signal and the repetitive sawtooth pulses for pulse duration modulation. **(4 marks)**
- 4) Draw, label and explain the characteristics of the block diagram of a typical cellular telephone system showing three cell towers. **(7 marks)**
- 5) Explain the relationship between antenna length and wavelength. **(2 marks)**
- 6) List three characteristics of Log periodic Antenna. **(3 marks)**
- 7) Each cell site's radio base station uses a computerized transceiver with an antenna to provide coverage. The area a base station covers is called a cell. Name the three things on which the area served depends on ? **(1.5 marks)**
- 8) 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)**

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