



**FIJI NATIONAL UNIVERSITY**

**COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY**

**SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**CERTIFICATE IV IN ELECTRONIC COMMUNICATION**

**EEE420 – ELECTRONIC COMMUNICATION SYSTEMS 2**

**FINAL EXAMINATION – PENSTER 2, 2014.**

**INSTRUCTIONS TO STUDENTS**

1. You are allowed 10 minutes to read, during which time you are NOT to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your ID 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. Clearly write the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. Attempt ALL questions.
9. Total marks is 100.

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

**Beside each question number write the corresponding alphabet that best represents your answer:**

1. Which statement best describes "a cell site" in mobile communication?
  - A. The spot where the base station and antennas are located.
  - B. The area a base station covers.
  - C. The area of wide coverage.
  - D. None of the above.
2. What element of a yagi antenna radiates the RF signal?
  - A. Dipole
  - B. Director
  - C. Reflector
  - D. Boom
3. Communication from the transponder to an earth station is known as:
  - A. Uplink
  - B. Downlink
  - C. Crosslink
  - D. Forward-link
4. In PCM, name the stage before sampling.
  - A. Filtering
  - B. Quantizing
  - C. Holding
  - D. None of the above
5. Which term applies to the highest point of the satellite while orbiting earth?
  - A. Apogee
  - B. Perigee
  - C. Ascending node
  - D. Inclination
6. Which statement best describes the term "multiplexing"?
  - A. One input and several outputs
  - B. Several inputs and one output
  - C. Several inputs and outputs
  - D. One input and one output

7. The sampling rate for frequency band 3 – 18 KHz is:
- A. 8 KHz
  - B. 64 Kbps
  - C. 36 KHz
  - D. 32 Kbps
8. One disadvantage of optical fiber 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
9. In a 32 level PCM code, each decimal number is represented by a series of:
- A. 3 binary digits
  - B. 4 binary digits
  - C. 5 binary digits
  - D. 6 binary digits
10. What is the down link frequency for the Ku- Band Satellite Communication?
- A. 18 GHz
  - B. 3 GHz
  - C. 12 GHz
  - D. 40 GHz
11. In satellite communication, the term "polar orbit" means:
- A. Satellite passing over the East and West
  - B. Satellite passing over the North and South
  - C. Satellite passing North and West
  - D. Satellite passing South and East
12. When an electrical pulse is converted into light and propagated through an optic fiber, the light pulse will begin to spread around the fiber. This phenomena is known as:
- A. Dispersion
  - B. Immersion
  - C. Collision
  - D. Diversion
13. A cellular communication "macrocell" provides coverage for:
- A. Slow moving people between large buildings
  - B. Fast moving mobiles like those in vehicles
  - C. Low power transmission.
  - D. Large capacity in an area like a national stadium.

14. In cellular communication, most cells are split into sectors in order to:

- A. To be efficient and to carry more calls.
- B. To cover slow moving users.
- C. To reduce the transmission power
- D. To reduce the number of cells.

15. The life expectancy of a satellite is:

- A. 5 years
- B. 10 years
- C. 15 years
- D. 20 years.

## **SECTION B**

**[10 MARKS]**

**Write either TRUE or FALSE besides the question number in your answer booklet for each of the statement below.**

1. FDMA is widely used in digital cellular technology.
2. In pulse-modulated systems, as in an analog system, the intelligence may be impressed on the carrier by varying any of its characteristics.
3. The resolution of geostationary satellite image is better than the polar orbit satellite
4. Bit per second (Bps) is a measure of the number of data bits (digital 0's and 1's) transmitted each second in a communication channel.
5. An electronic system performing reception, frequency translation, and re-transmission is called a transponder.
6. A modem converts analog signal to digital and vice versa.
7. Individual characters (letters, numbers etc) also referred to as bytes, are composed of several bits.
8. In cellular communication, a pico-cell is used to cover selected outdoor areas.
9. The basic concept behind the cellular radio system is that the system serves a geographical area with a single transmitter and receiver.
10. Station-keeping is the process of adjusting the orbit of a geostationary satellite so that it appears to remain stationary above a point on earth.

**SECTION C**

**FILL IN THE BLANKS**

**[10 MARKS]**

Choose the correct answer from the list given below by writing the most suitable answer against the question number in the answer booklet:

**Baud rate, Polar Orbit, laser diodes, CDMA, Station keeping, Polar orbit, A half of a wavelength, macro cell, TDMA, Bit rate, Time, Electronic serial number, Tracking, microcell cell**

1. In Time Division Multiplexing or TDM individual calls are separated by \_\_\_\_\_
2. Effective antennas are cut to \_\_\_\_\_
3. \_\_\_\_\_ is a measure of the number of data bits (0s and 1s) transmitted in each second in a communication channel.
4. One of the two unique numbers in every mobile unit is \_\_\_\_\_
5. A \_\_\_\_\_ provides coverage especially to slow moving people between large buildings.
6. \_\_\_\_\_ is a measure of the number of times per second a signal in a communications channel varies, or makes a transition between states (states being frequencies, voltage levels or phase angles).
7. In \_\_\_\_\_ the multiplex involves data that are presented by codes.
8. \_\_\_\_\_ is the process of continuously adjusting the position of the antenna on the ground so that it always points at the satellite.
9. \_\_\_\_\_ satellites are those passing over the north and south poles.
10. \_\_\_\_\_ is normally used as light source in optical fiber communication.

**SECTION D: Theory & short answers**

**[30 MARKS]**

- 1) Explain the term "Sampling" as used in PCM and show the mathematical expression. What is the effect if the sampling rate is lower than the actual? **(3marks)**
- 2) State two advantages and one disadvantage of polar orbits? **(3 marks)**
- 3) Name three types of antennas. **(3 marks)**
- 4) Name the four key components that make up most cellular radio systems. **(3 marks)**
- 5) In what two significant ways a cellular system differs from conventional radio telephone system? **(3 marks)**
- 6) What are the two main differences between Frequency division multiplexing and Time division multiplexing? **(3 marks)**
- 7) Name the three types of network configuration that are possible with optical fiber **(3 marks)**
- 8) State two characteristics of laser diodes and photo diodes. **(3 marks)**
- 9) List the three hierarchical levels of any cell network. **(3 marks)**
- 10) State three advantages of using fibre optics. **(3 marks)**

**SECTION E**

**Explanation & Calculations**

**[35 MARKS]**

- 1) a) Explain in your own words the function of the “reflector” element in a Yagi?  
b) Calculate the length of the antenna for maximum radiation if the frequency of operation is 3MHz.  
c) Draw a diagram to construct this HF wire antenna

(9 marks)

- 2) Draw a block diagram of a satellite transponder and discuss the function of each block. Assume the transponder operates on C band.

(7 marks)

- 3) With the aid of diagrams, discuss the processes involved in Pulse Code Modulation (PCM)

(9 marks)

- 4) Derive from voice frequency (0.3 – 4 KHz) the lowest level hierarchy of TDM signal of one E1 Carrier. (Note E1 has 30 Time slots for data)

(10 marks)

**\*\*\*\*\*THE END\*\*\*\*\***