



CERTIFICATE IV IN ELECTRICAL & ELECTRONIC ENGINEERING

EEE420 – ELECTRONIC COMMUNICATIONS SYSTEM 2

FINAL EXAMINATION – PENSTER 2 - 2016.

DURATION: 3 HRS

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes **EXTRA** as 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 foolscap, graph paper, drawing paper, etc. in their correct sequence and secure well.
 5. For all sheets of paper on which rough/draft work has been done, cross it through and attach to your answer scripts.
 6. Show all workings where necessary
 7. Diagrams and graphs can be drawn in pencil.
 8. Non- programmable calculators are allowed.
 9. **Answer ALL the questions in every Section.**
 10. Check your work before you leave the room!!
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SECTION A**MULTIPLE CHOICE****[10 MARKS]**

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

1. In satellite communication, the term "synchronous 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

2. What element of a yagi antenna radiates the RF signal?
 - A. Dipole
 - B. Director
 - C. Reflector
 - D. Boom

3. In PCM, name the stage after sampling.
 - A. Filtering
 - B. Quantizing
 - C. Holding
 - D. Coding

4. 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

5. The sampling rate for signal 0.3 – 20 KHz bandwidth is:
 - A. 8 KHz
 - B. 64 KHz
 - C. 40 KHz
 - D. 10 KHz

6. One disadvantage of optical fiber is:
- A. Light weight
 - B. Highly skilled staff would be required for maintenance
 - C. Very difficult to tap into the optical fibre to read the data signals
 - D. Non-conductive
7. In a 16 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
8. A cellular communication "microcell" provides coverage for:
- A. Remote areas.
 - B. Fast moving mobiles like those in vehicles
 - C. Small area (a half mile in diameter) and are used in urban zones.
 - D. Large capacity in an area like a national stadium.
9. 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.
10. The life expectancy of a satellite is:
- A. 5 years
 - B. 10 years
 - C. 15 years
 - D. 20 years.

SECTION B

[10 MARKS]

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

1. TDMA is widely used in analog 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 4G (fourth generation) cellular technology is based on Internet protocol networks and provide voice, data and multimedia service to subscribers.
7. Individual characters (letters, numbers etc) also referred to as bytes, are composed of several bits.
8. In Pulse Width Modulation, the amplitude is maintained constant but the duration or width of the pulse is varied in accordance with the instantaneous value of the analog signal.
9. Digital signals are very easy to receive. The receiver has to just detect whether the pulse is low or high.
10. "Frequency reuse" is based on the fact that after a distance a radio wave gets attenuated and the signal falls below a point where it can no longer be used or cause any interference.

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, Frequency, Subscriber Identity Module, Tracking, Roaming, Fibre optic.

1. In Frequency Division Multiplexing or FDM 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. _____ is a memory card (IC) holding identity information, phone book etc.
5. _____ allows the subscriber to send/receive calls outside the service provider's coverage area.
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 a type of transmission medium.

SECTION D:**Theory & short answers****[20 MARKS]**

- 1) List two advantages of digital signal over analog signals. **(2 marks)**
- 2) State two advantages and one disadvantage of polar orbits? **(2 marks)**
- 3) Name two types of antennas. **(2 marks)**
- 4) Name the four key components that make up most cellular radio systems. **(2 marks)**
- 5) A cluster is a group of adjacent cells in Cellular network. Give two (2) properties of a cluster. **(2 marks)**
- 6) What are the two main differences between Frequency division multiplexing and Time division multiplexing? **(2 marks)**
- 7) Name the three types of network configuration that are possible with optical fiber **(2 marks)**
- 8) State two characteristics of laser diodes and photo diodes. **(2 marks)**
- 9) List the three hierarchical levels of any cell network. **(2 marks)**
- 10) State three dis-advantages of fibre optics. **(2 marks)**

SECTION E

Explanation & Calculations

[50 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

(10 marks)

2) With the aid of diagrams, discuss how the following digital types of modulation can be derived from an analog signal?

- a) Pulse amplitude
- b) Pulse width
- c) Pulse position

(10 marks)

- 3) a) Explain the "Nyquist theorem on Sampling" as used in PCM and show the mathematical expression;
b) What is the effect if the sampling rate is lower than the actual?

(10 marks)

- 4) Given the voice frequency of 0.3 – 4 KHz,
a) Calculate the bit rate assuming 8 bit per sample.
b) Derive the lowest hierarchy of TDM signal of one E1 Carrier (Note E1 has 32 timeslots)

(10 marks)

- 5) a) With the aid of diagrams, draw a "Cellular Network" for mobile communication marking all blocks.
b) Explain the term "handoffs" in cellular communication and the steps taken when this type of operation is executed?

(10 marks)

-----**The End**-----

