SECTION A **MULTIPLE CHOICE** **[10 MARKS]**

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

1. 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

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

3. The most common light used in fiber-optic links is.
   A. Infra-red
   B. Red
   C. Violet
   D. Ultra violet

4. Fiber optic technology is used in applications of.
   A. Local area networks
   B. Cable TV (CATV) systems
   C. Telephone networks
   D. All the above

5. Which term applies to the lowest point of the satellite while orbiting earth?
   A. Apogee
   B. Perigee
   C. Ascending node
   D. Inclination

6. 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

7. Name the type of cellular service that identifies the maximum transmitter power level.
   A. Station class mark
   B. System identification number
   C. Mobile identification number
   D. Number assignment module

8. 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

9. Which type of modulation is found in encoders?
   A. PAM
   B. PWM
   C. PPM
   D. PCM

10. 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. Pulse code modulation refers to a system in which the standard values of a quantized wave are indicated by a series of coded pulses.
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. The spot where the base station and antenna are located is called a cell.
14. Cross-link is the term that relates to the communication between two transponders.
15. Frequency reuse is a technique of re using frequencies and channels within a communications system to improve capacity.

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, demodulator, one, $v = f \lambda$, communication, 16, 32, fibre optics, light, current, voltage, wide, communication, transverse, more, amplitude, frequency, satellite, microwave, difficult, single, antenna, directivity, dielectric, wavelength, PAM

1. A _____ mode fibre supports one propagating mode.

2. Inter-modal dispersion contributes largely to pulse spreading in _____ fibers.

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. Most antennas consist of a conductor and insulator, which may be _____ or it may be air.

7. _____ is the distance between successive crests of a wave.

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. _____ is a figure of merit for an antenna.

14. _____ is a device that transmits or receives electromagnetic waves.

15. _____ is the simplest pulse modulation to create.

SECTION D **[55 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) A transducer 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. Name three types of transducers with one example from each**.** **(3 marks)**

4) Define the following terms:
   a) Bandwidth **(1mark)**
   b) Transceiver **(1 mark)**
   c) Selectivity **(1 mark)**

5**)** 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)**

6) 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)**

7) 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)**

8) 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 super heterodyne receiver provides superior selectivity and sensitivity compared with simpler designs. Draw and label the block diagram of the super heterodyne receiver. **(4 marks)**

9) Explain the operation of a private automatic branch exchange (PABX). **(2 marks)**

10) Digital and analog systems are the two ways to display, store or manipulate information. Explain these two systems. **(2 marks)**

11) Draw a Yagi-Yuda antenna with a reflector, driven element, directors and boom. **(4 marks)**

12) Calculate the length of a half wave dipole if the transmitting frequency is 98.0 MHz? **(2 marks)**

13) 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)**

14) List three characteristics of Log periodic Antenna. **(1.5 marks)**

15) 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)**

16) Explain the relationship between antenna and wavelength. **(2 marks)**

17) 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**********