

Code: AE130 Subject: OPTOELECTRONICS AND COMMUNICATION**AMIETE – ET (New Scheme)**

Time: 3 Hours

December - 2017

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. What makes optical fibers immune to EMI?
(A) They transmit signals in as light rather than electric current.
(B) They are too small for magnetic fields to introduce current in them.
(C) Magnetic fields cannot penetrate the glass of the fiber.
(D) They are readily shielded by outer conductors in cable.
- b. Which of the following statement is correct?
(A) In step index fiber the core is uniform throughout and undergoes an abrupt change at the cladding boundary.
(B) In graded index Fiber, the core refractive index is made to vary as a function of the Radial distance from the center of the fiber.
(C) Both (A) & (B)
(D) None of these.
- c. Pulse broadening in Multimode fibers is due to
(A) Intermodal dispersion (B) Intramodal dispersion
(C) Both (A) & (B) (D) None of these
- d. Acceptance angle is the
(A) Minimum angle of incidence
(B) Maximum angle of incidence
(C) It can be maximum or minimum depending on nature of material used in core
(D) None of these.
- e. Spectral bands designations in optical fiber communications include
(A) Original band, O band-1260 to 1360nm
(B) Extended band, E-Band-1360 to 1460nm
(C) Short band, S-band-1460 to 1530nm
(D) All of these

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- f. Snell's law relates _____.
- (A) Light reflection (B) Light refraction
(C) Light transmission (D) Light Absorption
- g. The core of an optical fiber has a
- (A) Lower refracted index than air
(B) Lower refracted index than the cladding
(C) Higher Refractive index than the cladding
(D) Similar refractive index with the cladding
- h. The critical angle of incidence is
- (A) The angle of incidence that causes the refracted light to travel along the interface between the two different mediums.
(B) The minimum angle of incidence at which the ray strikes the interface of 2 media and causes an angle of refraction equal to 90° .
(C) Both (A) & (B)
(D) None of these
- i. The conditions for total internal reflection
- (A) Light should travel from denser medium to rarer medium
(B) The angle of incidence should be greater than the critical angle of the denser medium.
(C) Both (A) & (B)
(D) None of these
- j. Fiber optic cables operate at frequencies near
- (A) 20 MHz (B) 200 MHz
(C) 2GHz (D) 800 THz

**Answer any FIVE questions out of EIGHT questions.
Each question carries 16 marks.**

- Q.2** a. Explain with neat diagram mode field diameter and propagation modes in single mode fiber. (8)
- b. List out the requirements for selecting materials for optical fiber and also explain briefly different fiber materials used in optical fibers. (8)
- Q.3** a. Discuss briefly Macro-bending and Micro-bending losses with a neat diagram (8)
- b. Explain briefly various signal dispersion in optical fibers. (8)
- Q.4** a. Explain surface emitting and edge emitting LED with a neat diagram. (8)
- b. Derive the quantum efficiency and power emitted by the LED and also explain External quantum efficiency with the help of equations. (8)

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- Q.5** a. Explain different lensing schemes for coupling improvement. (8)
b. Explain types of mechanical misalignments that can occur between two joined fibers. (8)
- Q.6** a. Derive an expression for Bit error rate and probability of error for Receiver sensitivity. (8)
b. Draw the block diagram and explain analog receivers. (8)
- Q.7** a. Explain briefly the key system requirements that are needed in a point to point links. (8)
b. Discuss the aspects of Rise-time budget with the help of equations. (8)
- Q.8** a. Derive an expression for Carrier to Noise Ratio. (8)
b. Explain multiple Amplitude Modulation Techniques. (8)
- Q.9** a. Define WDM. With the help of schematic explain the operational principle of WDM. (8)
b. Explain briefly the following (8)
(i) Any two possible applications of optical amplifiers with diagrams.
(ii) SDH/SONET.