

B. Tech Odd Semester Examination, February, 2023

Electronics & Communication Engineering
(7th Semester)

Course No.: EC-EL-10
(Optical Electronics & Optical Communication)

Full Marks: 50

Pass Marks: 15

Time: 2 hours

- Note:**
1. Attempt any five questions.
 2. Begin each answer in a new page.
 3. Answer parts of a question at a place.
 4. Assume reasonable data wherever required.
 5. The figures in the right margin indicate full marks for the question.
 6. All the mathematical symbols and abbreviations have their usual meanings.

1. a) Explain with block diagram the fundamentals of optical communication.

b) Define Snell's law and critical angle.

A light ray is incident from glass to air. Calculate the critical angle.

Calculate the refractive indices of the core and cladding material of an optical fiber whose $NA=0.35$ and $\Delta=0.01$. $5+(2+1+2)=10$

2. a) Explain three different mechanisms that cause absorption of optical energy in optical fibers.

b) Mention advantages and disadvantages of optical fiber communication systems. $5+5=10$

3. a) What is fiber optic connector? Explain with proper diagram, the different types of fiber optic connectors.
- b) A photo diode has quantum efficiency of 65% when photons of energy 1.5×10^{-19} are incident on it.
- Calculate-
- (i) At what wavelength is the photo diode operating.
- (ii) The incident optical power required to obtain a photo current of $2.5\mu\text{A}$ when the photo diode is operating on given condition.
 $(4+1)+(2+3)=10$
4. a) Discuss with the aid of suitable diagram, the three types of fiber-to-fiber misalignment which may contribute to insertion loss at a joint.
- b) What is lensing schemes? With simple sketch show different lensing schemes. Also mention its drawbacks.
 $5+(1+3+1)=10$
5. a) Discuss the pulse broadening in graded index fibers.
- b) A multimode graded index fiber exhibits total pulse broadening of $0.1\mu\text{sec}$ over a distance of 12km .
- Calculate-
- i) The maximum possible bandwidth on the link assuming no ISI
- ii) The pulse broadening per unit length
- iii) The bandwidth length product of the fiber.
 $4+6=10$
6. a) Explain the important conditions for total internal reflection to exist in fiber
- b) Discuss dispersion in optical fiber? Explain different types of dispersion which affects the performance.
 $5+(1+4)=10$
7. a) For 30 Km long fiber attenuation 0.8 dB/Km at 1300 nm . If a $200\mu\text{W}$ power is launched into the fiber, find the output power.
- b) A multimode graded index fiber exhibits total pulse broadening of $0.1\mu\text{ sec}$ over a distance of 15 Km .
- Calculate:
- i) The maximum possible bandwidth on the link assuming no ISI.
- ii) The pulse dispersion per unit length
 $4+(3+3)=10$
8. a) With the neat sketch explain WDM scheme. Also mention its features.
- b) For 2×2 fiber coupler, input is $200\mu\text{W}$, throughput power is $90\mu\text{W}$, coupler power is $85\mu\text{W}$ and crosstalk power is $6.3\mu\text{W}$. Compute the performance parameters of the coupler.
 $(3+2)+5 = 10$
