

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2023

B.Tech-VII Semester (ALL)

COURSE CODE(CREDITS): 18B1WPH732 (3)

MAX. MARKS: 15

COURSE NAME: OPTICAL FIBER NETWORK DESIGN

COURSE INSTRUCTORS: SKK

MAX. TIME: 1 Hour

*Note: (a) All questions are compulsory and Marks are indicated against each question
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

1. Using diagrams, point out the basic design difference of optical cable, when used under earth and when suspended in air. [3]
2. (a) Consider a fiber with a $100\mu\text{m}$ core diameter and a $140\mu\text{m}$ cladding diameter. If $n_1 = 1.48$ and $\Delta = 1\%$, calculate the V- parameter if the operating wavelength is 850 nm ?
(b) Find the value of V at a wavelength of 850 nm if the diameter of the core is $50\mu\text{m}$?
(c) Calculate the number of modes for each case. [4]
3. (a) Explain the concept of scattering loss. How can linear losses be reduced in fibers.
(b) Consider a 16/125 single mode fiber operating at 1300 nm with a loss of 0.8 dB/km , calculate the threshold power for Raman scattering and the line width of source. [3]
4. Calculate the critical radius of curvature for a multimode 50/125 fiber with an NA of 0.2 operating at 850 nm . Also calculate for a 9/125 single mode fiber with an NA of 0.08 operating at 1300 nm ? [2]
5. Calculate the number of modes in a 50/125 graded index fiber having a circular index ($g=2$), core index 1.485, cladding index 1.461 at an operating wave length 0.820 micrometers. How will the number of modes change if the wavelength is increased by 480 nm ? If this fiber is not graded index then calculate the number of modes with the same parameters. [3]