JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATION -2016

B.Tech VIIIth Semester

COURSE CODE: 11BWEC834 MAX. MARKS: 15

COURSE NAME: OPTICAL COMMUNICATION SYSTEMS

COURSE CREDITS: 3 MAX. TIME: 1 HR

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. All parts of the question should be attempted at one place.

Q1 (a) The speed of light in vacuum and in the core of a step index fiber is 3×10^8 m/s and 2×10^8 m/s respectively. When the fiber is placed in air, the critical angle at the core cladding interface is 75 degrees. Calculate the: (i) NA of the fiber, (ii) Multipath time dispersion per unit length. **(2)**

(b) Draw the block diagram of optical communication system and explain each block in brief. **(2)**

(c) Differentiate between step index and graded index fiber. **(1)**

Q2 (a) Calculate the maximum thickness of the guide slab of a symmetrical planar waveguide so that it supports the first 10 modes. Take n_1=3.6 and n_2=3.58 and λ=0.90μm. Also calculate the maximum and minimum values of propagation constant β. **(2)**

(b) Derive an expression for material dispersion in case of step index fibers. Also represent zero dispersion graphically. **(2)**

(c) What are modes? How does one distinguish between symmetric and antisymmetric modes of a planar waveguide? **(1)**

Q3 (a) A single mode fiber is measured to have $\lambda^2(d^2n/d\lambda^2) = 0.02$ at 0.8μm. Calculate the dispersion parameters β_2 and D. **(2)**

(b) Derive the equations for TE and TM modes. **(2)**

(c) A 1-hour lecture script is stored on the computer hard disk in the ASCII format. Estimate the total number of bits assuming a delivery rate of 200 words per minute and on average 5 letters per word. How long will it take to transmit the script at a bit rate of 1Gb/s? **(1)**

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