

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2 EXAMINATION- APRIL - 2018

B. Tech (VIIIth Semester) (ECE)

COURSE CODE: 11B1WEC834

MAX. MARKS: 25

COURSE NAME: OPTICAL COMMUNICATION SYSTEMS

COURSE CREDITS: 03

MAX. TIME: 1.5 HR

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Marks are indicated below each question

Q1(a) Derive an expression for material dispersion parameter D_m for pure silica and the waveguide dispersion parameter D_w for single mode fibers. [4 Marks]

(b) Differentiate between k , b and β . How are these three interrelated? [2 Marks]

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 $\lambda = 0.90\mu\text{m}$. Also calculate the maximum and minimum values of the β . [3 Marks]

(b) Differentiate between multimode step index and graded index fiber. Also highlight the difference between multimode and single mode fibers. [2+2 = 4 Marks]

Q3(a) A step index single mode fiber has a core index of 1.48, relative refractive index difference of 0.27%, and a core radius of $4.4\mu\text{m}$. Estimate the waveguide dispersion for this fiber at a wavelength of $1.32\mu\text{m}$. [2 Marks]

(b) Calculate the injection efficiency of GaAs diode in which $N_a = 10^{23}/\text{m}^3$ and $N_d = 10^{21}/\text{m}^3$. Assume that at RT=300K, $\mu_e = 0.85\text{m}^2/\text{v/s}$, $\mu_h = 0.04\text{m}^2/\text{v/s}$ and $L_e = L_h$. [2 Marks]

Q4(a) With reference to single mode fibers explain the following [4.5 Marks]

(i) Birefringence

(ii) Polarization Mode Dispersion

(iii) Rayleigh Scattering

(b) Using Maxwell's equations, derive the equations of TE mode for optical fibers. [3.5 Marks]
