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MAKE UP EXAMINATION – APRIL 2018

B.Tech (VIIIth Semester) (ECE)

COURSE CODE: 11B1WEC834 MAX. MARKS: 25

COURSE NAME: OPTICAL COMMUNICATION SYSTEMS

COURSE CREDITS: 4 MAX. TIME: 1.5HR

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

Q1(a) The speed of light in vacuum is 3 x 10^8 m/s and in the core is 2 x 10^8 m/s. When the fiber is placed in air, the critical angle at the core cladding interface is 75°. Calculate the (i) NA of the fiber and (ii) multipath time dispersion per unit length. **[2 marks]**

(b) Explain multipath time dispersion and material dispersion in optical fibers. How can these be minimized? **[3 marks]**

Q2(a) A symmetrical SI planar waveguide is made of glass with n_1=1.5 and n_2=1.49. The thickness of the guide layer is 9.83μm and the guide is excited by a source of wavelength λ =0.85μm. What is the range of the propagation constants? What is the maximum number of modes supported by the guide? **[2 marks]**

(b) What are single mode fibers? Elaborate the characteristics of SMFs. **[4 marks]**

Q3(a) A step index single mode fiber exhibits material dispersion of 6ps/nm/km at an operating wavelength of 1.55μm. Assume that n_1 = 1.45 and Δ = 0.5%. Calculate the diameter of the core needed to make the total dispersion of the fiber zero at this wavelength. **[2 marks]**

(b) Calculate the intrinsic carrier concentration in a semiconductor GaAs at room temperature (RT=300K) from the following date: m_e = 0.07m, m_h = 0.56m, E_g = 1.43eV, where m is the mass of an electron in free space. **[2 marks]**

Q4(a) Derive an expression for waveguide dispersion in single mode fibers. **[3 marks]**

(b) Briefly explain different types of losses in single mode fibers. **[3 marks]**

(c) Differentiate between circular polarization and elliptical polarization. With reference to this explain the phenomena of birefringence in optical fibers. **[4 marks]**

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