

**B.Tech. – VIEP – ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

Term-End Examination

December, 2015

**BIELE-008 : OPTO ELECTRONICS
COMMUNICATION SYSTEMS**

Time : 3 hours

Maximum Marks : 70

Note : *Attempt any seven questions. All questions carry equal marks. Missing data, if any, may be suitably assumed. Use of scientific calculator is permitted.*

1. Explain the operation of a typical optical fiber communication system with the help of a neatly labelled block diagram. What are the advantages of an optical fiber communication system ? 6+4=10

2. Mathematically give the solution of Maxwell's equation in a circularly symmetric step-index optical fiber. 10

3. Explain the phenomenon of dispersion in single-mode and multi-mode fibers. Define the term polarization. How is it maintained in fibers ? 5+2+3=10

4. (a) Classify optical fibers on the basis of fiber mode and refractive index variation. 6
- (b) Calculate the maximum allowable radius of a single-mode fiber with $n_1 = 1.53$ and $n_2 = 1.5$ operating at a wavelength of 1300 nm. 4
5. Explain the operating principle of a light-emitting diode (LED) with the help of a neatly labelled diagram. 10
6. Derive the expression for the following terms for an avalanche photodiode : 3+3+4=10
- (a) Responsivity
- (b) Sensitivity
- (c) Quantum Efficiency
7. Calculate the maximum 3-dB bandwidth for a silicon P-I-N photodiode with a 25 μm depletion layer width and with a carrier velocity of 3×10^4 m/s. 10
8. Explain the operation of Raman amplifier in the amplification of optical signals. 10

9. Differentiate between low-impedance and high-impedance pre-amplifiers used in optical fiber systems. 10
10. Write short notes on any *two* of the following : 10
- (a) Kerr Non-linearity
 - (b) Trans-impedance Receivers
 - (c) Graded Index Fibers
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