

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI- EXAMINATION – SUMMER 2016

Subject Code:161005

Date:11/05/2016

Subject Name:Optical Communication

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Describe the advantages of fiber optic communication in detail. 07
(b) A point source of light is 12 cm below the surface of a large body of water ($n=1.33$). What is the radius of the largest circle on the water surface through which the light can emerge? 07
- Q.2** (a) Define acceptance angle and N.A. with figure and derive the equation for N.A. 07
(b) (1) A step index fiber has an acceptance angle of 20° . Relative refractive index difference of 1%. Estimate N.A. and critical angle at core-cladding interface. 07
(2) calculate the refractive indices of the core and cladding materials of an optical fiber whose N.A.=0.35 and $\Delta=0.01$
- OR**
- (b) (1) The relative refractive index difference for an optical fiber is 1%. What is the N.A. of the fiber if core index is 1.47 07
(2) Define: (i) skew rays (ii) V number.
- Q.3** (a) A step index fiber in air has a N.A. of 0.16 and a core refractive index of 1.45 and a core diameter of $60\mu\text{m}$. Determine the normalized frequency for the fiber when light at a wavelength of $0.82\mu\text{m}$ is transmitted. Estimate the number of guided modes propagating in the fiber. 07
(b) With figure explain Outside Vapour Phase Oxidation (OVPO) method of fiber fabrication in detail. 07
- OR**
- Q.3** (a) With figure explain Modified Chemical Vapour Deposition (MCVD) method of fiber fabrication in detail. 07
(b) Briefly describe: (i) Rayleigh scattering (ii) Mie scattering. 07
- Q.4** (a) With respect to LASER explain: (i) Absorption of radiation 07
(ii) Spontaneous emission
(iii) Stimulated emission
- OR**
- (b) With figure explain the construction and features of surface emitter LED. 07
- OR**
- Q.4** (a) With figure explain the construction and features of Superluminescent LED. 07
(b) With figure explain the mechanical splicing in fiber. 07
- Q.5** (a) A photo diode has quantum η_q of 70% when photon of energy 1.8×10^{-19} J are falling on it. 07
(i) At what wavelength the photo diode is operating?
(ii) Calculate the incident optical power required to obtain a photo Current of $3\mu\text{A}$, when the photo diode is operating as above.

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- (b) With block diagram explain the operation of Optical receiver. 07
- OR**
- Q.5** (a) Describe Optical Link Power Budget and explain how to calculate optical power budget. 07
- (b) Write short note on: Optical Time Domain Reflectometry (OTDR). 07
