Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014**

**Subject code: 1710405** **Date: 27-06-2014**

**Subject Name: Fiber Optic Communication**

**Time: 02:30 pm - 05:00 pm** **Total Marks: 70**

## Instructions:

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

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|---|---|---|---|
| **Q.1** | **(a)** | Drawn and explain the refractive index profile and ray transmission in : 1)Step index fiber. 2)Graded index fiber. | **07** |
| | **(b)** | Explain the evolution of Fiber Optics Systems. | **07** |
| **Q.2** | **(a)** | A point source of light is 12 cm below the surface of a large body of water (n=1.33 for water). What is the radius of the largest circle on the water surface through which the light can emerge? | **07** |
| | **(b)** | Calculate the numerical aperture of a step index fiber having $n_1$ = 1.48 and $n_2$ = 1.46. What is the maximum entrance angle $d_{0,max}$ for this fiber if the outer medium is air with n = 1.00? | **07** |
| | | **OR** | |
| | **(b)** | Explain the phenomenon of total internal reflection using Snell's law and derive the expression for Numerical Aperture. | **07** |
| **Q.3** | **(a)** | Explain the classification of optical fibers. Also explain different fiber materials in short. | **07** |
| | **(b)** | Define signal attenuation and how is it mathematically expressed. Explain the following: 1. Scattering Losses. 2. Bending losses. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Discuss absorption losses in optical fibers, comparing and contrasting the Intrinsic and Extrinsic absorption mechanisms. | **07** |
| | **(b)** | Explain pulse broadening in graded-index fiber. What is mode coupling? | **07** |
| **Q.4** | **(a)** | Explain the basic concept of LASER and with energy state diagram describe the absorption and emission of radiation in LASER. | **07** |
| | **(b)** | Draw and explain the structure of Edge Emitter LED. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Compare the main characteristics of PIN photodiode and APD. | **07** |
| | **(b)** | Compare LEDs and LASERs. | **07** |
| **Q.5** | **(a)** | With neat diagram explain the optical time domain reflectometry (OTDR) or the Back scatter measurement method in optical fiber. List out OTDR field applications. | **07** |
| | **(b)** | Write a short note on EDFA. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Write a short note on WDM. | **07** |
| | **(b)** | Discuss 2 x 2 fiber coupler. Also define various performance parameters of an optical coupler. | **07** |

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