Enrolment No.\_\_\_\_\_

|             | Ν          | GUJARAT TECHNOLOGICAL UNIVERSITY<br>ME - SEMESTER– I (New course)• REMEDIAL EXAMINATION – SUMMER 2015   |          |
|-------------|------------|---|----------|
|             | Su         | bject Code: 2710503 Date:18/05/2015   |          |
|             | Sul        | bject Name: Fiber Optic Communication   |          |
|             | Tiı        | me: 10:30 am to 1:00 pm Total Marks: 70   |          |
|             | Inst       | tructions:  |          |
|             |            | 1. Attempt all questions.   |          |
|             |            | <ol> <li>Make suitable assumptions wherever necessary.</li> <li>Figures to the right indicate full marks</li> </ol>   |          |
| 01          | (9)        | 5. Figures to the right indicate full marks.<br>Explain different Modes in step index fiber   | 07       |
| Q.1         | (h)        | Explain the evaluation of Fiber Optic Systems   | 07       |
| •••         | (~)        |   | 07       |
| Q.2         | (a)        | A Graded index fiber has a core with a parabolic refractive index profile which has a diameter of 50 m. The fiber has a numerical aperture of 0.2. Estimate the total number of suided modes propagating in the fiber when it is operating at a wavelength of 1 m.                            | 07       |
|             | (b)        | Explain the phenomenon of total internal refection using Snelløs law and derive the expression for Numerical Aperture.  | 07       |
|             |            | OR  |          |
|             | (b)        | 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       |
| 0.3         | (a)        | Discuss absorption losses in optical fibers, comparing and contrasting the intrinsic and  | 07       |
|             |            | Extrinsic absorption mechanisms.  |          |
|             | (b)        | A step index multimode fiber with a Numerical aperture of 0.25 supports approximately 1200 modes at an 850 nm wavelength.   | 07       |
|             |            | <ul> <li>What is the diameter of this core?</li> <li>ii) How many modes does the fiber support at 1220 nm?</li> </ul>   |          |
|             |            | iii) How many modes does the fiber support as 1520 nm?  |          |
| <b>Q.3</b>  | <b>(a)</b> | Define signal attenuation and how it is mathematically expressed?   | 07       |
| -           |            | Explain the following:  |          |
|             |            | i) Bending Loss ⅈ) Scattering Loss  |          |
|             | (b)        | An InGaAs pin photodiode has the following parameters at a wavelength of 1300 nm: $Id=4nA$ , =0.90, RL=1000 and the surface leakage current is negligible. The incident optical power is 300nW (- 35 dBm), and the receiver bandwidth is 20 MHz. Find various noise currents of the receiver. | 07       |
| 04          | (9)        | Explain the structure of distributed feedback (DFR) laser diode with neat sketch  | 07       |
| <b>ч</b> .т | (a)<br>(b) | Draw and explain the structure of Edge Emitter LED.   | 07       |
|             | (~)        | OR  |          |
| Q.4         | <b>(a)</b> | Write a short note on fiber bragg gratings  | 07       |
|             | (b)        | A photo diode has a quantum efficiency of 65% when photons of energy 1.5x10exp -19 J  | 07       |
|             |            | are incident upon it,   |          |
|             |            | <ul> <li>ii) At what wave length is the photo diode operating?</li> <li>iii) Calculate the incident optical power required to obtain a photo current of 2.5 A when the photo diode is operating as describe above.</li> </ul>   |          |
| Q.5         | (a)        | Explain a setup of Raman Amplification system.  | 07       |
|             | (b)        | Write a short note on WDM.  | 07       |
|             | . ,        | OR  |          |
| Q.5         | (a)<br>(b) | Discuss 2x2 fiber coupler. Also define various parameters of an optical couplers<br>Explain different protection schemes in SONET/SDH   | 07<br>07 |

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