

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC-Semester –V (May-2012) Examination****Subject code: X51102****Subject Name: Optical Communication****Date: 15/05/2012****Time: 10.30 am – 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) Explain the digital optical fiber link & discuss the advantage of optical fiber communication. **07**
- (b) Explain the intermodal & intramodal dispersion, and define the term group delay & cutoff wavelength. **07**

- Q.2** (a) Solve the followings. **07**
- i) A graded index fiber with a parabolic refractive index profile which has a diameter of 50 μm . The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating wavelength of 1 μm .
- ii) A silica optical fiber with a core diameter large enough to be ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine
- a) Critical angle at core cladding interface.
- b) Numerical aperture for the fiber.
- c) The acceptance angle in air for the fiber.
- (b) Explain splicing techniques and enlist the characteristics of optical fiber connectors. **07**

OR

- (b) Enlist the fiber fabrication methods & explain any one in brief with neat sketch. **07**

- Q.3** (a) Enlist the basic attenuation mechanisms in fiber, and discuss any two in brief. **07**
- (b) Compute the fiber to fiber joint loss across the butt joint of two identical GI fibers for axial misalignment. **07**

OR

- Q.3** (a) Explain in brief synchronous optical network. **07**
 (b) Classify the optical amplifier, and discuss Erbium doped fiber amplifier. **07**

- Q.4** (a) Discuss the population inversion and explain Fabry Perot resonator cavity for a laser diode. **07**
 (b) Determine the emission wavelength for given light source material a) $\text{Ga}_{1-x}\text{Al}_x\text{As}$, $x = 0.07$ b) $\text{In}_{0.74}\text{Ga}_{0.26}\text{As}_{0.57}\text{P}_{0.43}$ **07**

OR

- Q.4** (a) Define two important characteristics of photodetector, and Describe the working of RAPD with neat sketch. **07**
 (b) Solve the followings **07**
 i) A Laser Diode has lateral $\theta = 0^\circ$ & transverse $\theta = 90^\circ$ half power beam width of $2\theta = 60^\circ$ & 30° respectively. Calculate the transverse & lateral power distribution coefficient for this device.
 ii) When 3×10^{11} photons each with a wavelength of $0.85 \mu\text{m}$ are incident on a photodiode, on average 1.2×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency & the responsivity of the photodiode at $0.85 \mu\text{m}$.

- Q.5** (a) Explain optical time domain reflectometer and describe the OTDR trace. **07**
 (b) Explain the basic setup for making the eye diagram measurements, and explain the eye pattern with neat sketch along with key performance parameters. **07**

OR

- Q.5** (a) Explain the point to point link in detail & discuss the optical power loss model. **07**
 (b) Describe the insertion loss method for optical attenuation measurement. **07**
