

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2161005****Date: 12/12/2019****Subject Name: Optical Communication****Time: 02:30 PM TO 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.

		MARKS
Q.1	(a) Give the comparison of Step Index and Graded Index Fibers.	03
	(b) Briefly Describe the block diagram of Optical Communication Systems.	04
	(c) A multimode step index fiber has a refractive index difference of 1% and a core refractive index of 1.5. The number of modes propagating at a wavelength of $1.3\mu\text{m}$ is 1600. Calculate the acceptance angle, numerical aperture and the diameter of the fiber core.	07
Q.2	(a) Explain the significance of Carrier confinement related to the optical source.	03
	(b) A typical LED emits light at a center wavelength of 920nm with $\Delta\lambda=20\text{nm}$, Calculate the Δf .	04
	(c) How does material dispersion occur in an optical fiber. Obtain the expression for group delay τ_{mat} resulting from the material dispersion and from this, deduce the relation for the pulses spread σ_{mat} in terms of material dispersion $D_{\text{mat}}(\lambda)$.	07
	OR	
	(c) Define signal attenuation and how is it mathematically expressed. Explain the Bending losses (Micro bending losses, Macro bending losses).	07
Q.3	(a) Mention difference between Electrical bandwidth and optical bandwidth.	03
	(b) “The optical power launched into a fiber does not depend on the wavelength of the source but only on it’s brightness” Justify.	04
	(c) Briefly discuss the possible sources of noise in optical receivers.	07
	OR	
Q.3	(a) Mention difference between Indirect band gap material and direct band gap material.	03
	(b) What is equilibrium numerical aperture. Give the significance of the same.	04
	(c) Explain detection process in the p-n photodiode. Define the quantum efficiency and responsivity of a photo detector.	07
Q.4	(a) Define with reference to eye diagram:	03
	(1) Width of eye opening	
	(2) Timing jitter.	
	(b) Discuss optical power loss model for a point to point link.	04

- (c) Explain the performance of passive linear bus and also prove that optical power available at a particular node decreases with increasing distance from source. **07**

OR

- Q.4** (a) Define Q factor for digital transmission through optical cable. **03**
(b) Consider a 30-km long optical fiber that has an attenuation of 0.8 dB/km at 1300 nm. If 200 μ W of optical power is launched into the fiber find out the optical output power P_{out} . **04**
(c) Write short notes on Synchronous optical fiber networks(SONET). **07**
- Q.5** (a) Discuss the Cut back technique for attenuation measurement. **03**
(b) Write short note on EDFA . **04**
(c) For a 2x2 fiber coupler show that the phase of the driven fiber always lags 90° behind the phase of the driving fiber. Also define the following related to optical coupler: (1) splitting ration (2) Excess loss (3) Insertion loss (4) Crosstalk **07**

OR

- Q.5** (a) Explain any one method for optical dispersion measurement. **03**
(b) Write short note on Raman Amplifier. **04**
(c) Explain Mach-Zehnder Interferometer (MZI) multiplexer in detail. **07**

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