Seat No.: _____ Enrolment No._____

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 1.3μm 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 $\Delta\lambda$=20nm, 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_{mat} (λ).	**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: (1) Width of eye opening (2) Timing jitter.	**03**
	(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 μW of optical power is launched into the fiber find out the optical output power Pout.	**04**
	(c)	Write short notes on Syncronous 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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