

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:2161005****Date:14-07-2023****Subject Name: Optical Communication****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Justify the following statements: 03	
	(i) Signal distortion mechanism in optical fiber limits the information rate of the signal.	
	(ii) A mode remains guided as long as propagation factor β satisfies the condition $n_2k < \beta < n_1k$.	
	(b) State the advantages of optical communication over conventional communication. 04	
	(c) Define the following terms: 07	
	(1) Phase velocity (2) Group velocity. (3) Skew ray (4) Meridional ray (5) Total Internal Reflection (6) V number of fiber. (7) Critical angle.	
Q.2	(a) Describe in detail about different types of Attenuation losses related to optical fiber. 04	
	(b) Draw refractive index profiles of Step Index cable and Graded Index cable. Define Stimulated Raman Scattering and Stimulated Brillouin Scattering. 03	
	(c) Compare Step and Graded index fibers. A silicon optical fiber with a core diameter large enough to be considered by Ray analysis has a core refractive index of 1.5 and cladding refractive index of 1.47. Calculate values of Critical Angel, Numerical Aperture and Acceptance angle for the same. 07	
	OR	
	(c) Compare Single Mode (S.M) and Multi Mode (M.M.) fibers. Calculate refractive index of core and cladding materials whose $NA=0.35$ and $\Delta = 0.01$. 07	
Q.3	(a) Define: (i) Optical confinement (ii) Carrier confinement. Describe in details about Double heterodyne junction structure of an optical source. 07	
	(b) An InGaAs PiN photo diode has operating wavelength 1300 nm, $I_D = 4nA$, $\eta=0.9$, $R_L=1000 \Omega$ with negligible surface leakage. $P_{in}= 300 nW$, $B_e=20MHz$. For these given data find the various noise values. 07	
	OR	
Q.3	(a) Describe briefly about the distributed feedback LASER with neat sketches. 07	
	(b) A given silicon avalanche photodiode has a quantum efficiency of 65 percentage at the wavelength of 900 nm. Suppose 0.5 μW of optical power produces a multiplied photocurrent of 10 μA . Calculate the value of multiplication factor M for the same. 07	
Q.4	(a) Describe about optical power loss model for a point to point link. 07	
	(b) Describe the optical receiver operation with required details. 07	
	OR	

- Q.4** (a) Give details about rise time budgeting in digital fiber optic system. **07**
(b) Write a short note on a PiN photo diode as an optical detector. **07**
- Q.5** (a) Explain the working principle of Wavelength Division Multiplexing (WDM) systems. **03**
(b) Explain about Semiconductor Optical Amplifiers (SOAS). **04**
(c) Describe about Arrayed Waveguide Grating (AWG), Optical Couplers (OC) and Optical Add Drop Multiplexer (OADM) used in optical communication systems. **07**
- OR**
- Q.5** (a) Explain about Raman Amplifiers used on optical networks. **03**
(b) Write short note on Synchronous Optical Fiber Networks (SONET). **04**
(c) Describe about OTDR. Explain any one method for optical dispersion measurement. **07**
