Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161005 **Date:04/12/2018**

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.**

Q.1	**(a)**	Differentiate single mode and multimode optical fibers.	**03**
	(b)	Explain about impact of attenuation and dispersion on signal while its propagation through optical fibers. List out various types of attenuation effects occurring in optical fiber.	**04**
	(c)	Compare a conventional communication system with an optical fiber communication system. With proper block diagram describe working of an optical fiber communication system in detail.	**07**
Q.2	**(a)**	Define terms: (a) Skew ray propagation (b) Meridional ray propagation (c) Total internal reflection with reference to optical fibers.	**03**
	(b)	A multimode step index fiber having a core diameter of 80 µm and a relative index difference of 1.5% is being operated at a wavelength of 0.85 µm. Core refractive index value of that cable is 1.48 Calculate value of: (i) Normalized frequency of fiber and (ii) Total number of guided modes for that optical cable.	**04**
	(c)	Classify linear scattering losses occurring in optical fibers and describe them in details.	**07**
		OR	
	(c)	Describe various Nonlinear scattering losses while signal propagation through optical fiber in optical communication systems.	**07**
Q.3	**(a)**	Discuss in brief about various dispersion phenomena occurring while signal propagation through optical fiber in optical communication systems.	**03**
	(b)	Differentiate LEDs and LASERs as optical sources.	**04**
	(c)	List out factors which decide the performance of optical reception in optical communication systems. Explain the principle, characteristics and operation of avalanche photodiode.	**07**
		OR	
Q.3	**(a)**	With the help of necessary figure properly explain DWDM in detail	**03**
	(b)	List out optical sources used in optical communication systems. Explain about any one of them with necessary figures.	**04**
	(c)	Draw neat sketch for OVPO Technique implementation for optical fiber fabrication process. Describe OVPO Technique in detail.	**07**
Q.4	**(a)**	A Laser diode has lateral ∅ =0°and transverse ∅ =90° half power beam widths of 2θ =70°and 35° respectively. Calculate transverse and lateral power distribution coefficient for this diode.	**03**
	(b)	The radiative and non-radiative recombination life times of minority carriers in the active region of a double heterojunction LED are 60ns and 100 ns respectively. Determine the total carrier recombination life time and optical power generated internally, if the peak emission wavelength is 0.87µm, and the drive current is 40 mA.	**04**
	(c)	Give classification of couplers used in optical fiber communication systems. Describe each one of them briefly.	**07**
		OR	

Q.4	**(a)**	Describe significance of use fiber connectors in optical communication link. List out various optical connectors.	**03**
	(b)	The radiative and non-radiative recombination life times of minority carriers in the active region of a double heterojunction LED are 50 ns and 100 ns respectively. Determine the total carrier recombination life time. When the peak emission wavelength is 0.86µm, and the drive current is 60 mA for that working structure.	**04**
	(c)	Define term splicing with reference to optical fiber link. Classify various techniques of splicing and describe them briefly with suitable figures.	**07**
Q.5	**(a)**	Discuss briefly the fabry parrot cavity resonator LASER with neat sketch.	**03**
	(b)	Explain working principle of EDFA used in fiber optical systems in detail.	**04**
	(c)	Write short note on Optical Time Domain Reflectometry (OTDR) method used in optical communication systems.	**07**

OR

Q.5	**(a)**	List out differences between graded index and step index fiber cables. Define Term V number for optical fiber cable.	**03**
	(b)	Explain in detail about Raman amplifiers used in optical communication systems.	**04**
	(c)	Write short notes on Synchronous Optical Fiber Networks (SONETs)	**07**

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