Student Exam No:_____

GANPAT UNIVERSITY

B. TECH SEM. VI ELECTRONICS & COMMUNICATION ENGINEERING

CBCS REGULAR EXAMINATION, MAY-2014

(2EC 603) OPTICAL FIBER COMMUNICATION

TIME: 3 HOURS **TOTAL MARKS: 70**

INSTRUCTIONS:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

SECTION-I

Que.-1	(A)	What are the advantages of optical fiber communication? Explain in detail.	6
	(B)	A graded index fiber with a parabolic index profile supports the propagation of 560 guided modes. The fiber has a numerical aperture in air of 0.3 and a core diameter of 65 μm. Determine the wavelength of the light propagating in the fiber. Further estimate the maximum diameter of the fiber which gives single-mode operation at the same wavelength.	6
		OR	
Que.-1	(A)	Why multimode graded index fiber is better than multimode step index fiber? Give the details of graded index fiber with necessary diagram.	6
	(B)	A single-mode step index fiber has a core diameter of 7 μm and a core refractive index of 1.49. Estimate the shortest wavelength of light which allows single-mode operation when the relative refractive index difference for the fiber is 1%.	6
Que.-2	(A)	What is Normalized Frequency in optical fiber? Discuss about modes in cylindrical fiber.	6
	(B)	Define material absorption losses in silica glass fibers.	5
		OR	
Que.-2	(A)	Explain about Dispersion shifted fibers.	6
	(B)	Silica has an estimated fictive temperature of 1400 K with an isothermal compressibility of 7×10^{-11} $m^2 N^{-1}$. The refractive index and the photo elastic coefficient for silica are 1.46 and 0.286 respectively. Determine the attenuation in decibels per kilometer due to the fundamental Rayleigh scattering in silica at optical wavelengths of 0.63 μm and 1.00 μm. Boltzmann's constant is 1.381×10^{-23} $J K^{-1}$.	5
Que.-3	(A)	Draw and explain Erbium doped fiber amplifier architectures.	6
	(B)	Write short note on basic applications of optical amplifiers.	6

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SECTION-II

Que.-4 (A) What is the meaning of surface emitting LED? Draw and explain about surface-emitting LED. 6

(B) A double – heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non – radiative recombination times of 30 ns and 100 ns respectly. The drive current is 40 mA. Find out bulk recombination lifetime, internal quantum efficiency and internal power. 6

OR

Que.-4 (A) Draw and explain edge-emitting double – heterojunction LED. 6

(B) A silicon avalanche photodiode has a quantum efficiency of 65% at a wavelength of 900 nm. Suppose 0.5 μW of optical power produces a multiplied photocurrent of 10 μA. Find out the multiplication M. 6

Que.-5 (A) What is the fundamental of LASER? Give the details of Distributed feedback LASER. 6

(B) Draw and explain bidirectional line switched SONET / SDH Rings. 5

OR

Que.-5 (A) How wavelength spacing can be increased in LASER? Explain about Vertical cavity surface emitting LASER. 6

(B) Draw and explain unidirectional path switched SONET / SDH Rings. 5

Que.-6 (A) An InGaAs p-i-n photodiode has the following parameters at a wavelength of 1550 nm : I_D = 4 nA, η = 0.90 , R_L = 1000 Ω and the surface leakage current is negligible. The incident optical power is 300 nW and the receiver bandwidth is 40 MHz. Find the various noise terms of the receiver. 6

(B) Explain in detail about Avalanche Photodiode. 6

End of Paper