



## BRAINWARE UNIVERSITY

**Term End Examination 2022** Programme - B.Tech.(ECE)-2019 **Course Name – Fiber Optic Communications** Course Code - PEC-ECEL702A (Semester VII)

LIBRARY Brainware University Barasat, Kolkata -700125

Full Marks: 60 Time: 2:30 Hours [The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.] Group-A (Multiple Choice Type Question) 1 x 15=15 Choose the correct alternative from the following: (i) Which of the following detectors is suitable for detection of weak optical signal? a) P-n photodiode b) P-i-n photodiode c) Avalanche photodiode d) photoconductor (ii) Which among the following is a key process adopted for the laser beam formation as it undergoes the light amplification? a) Spontaneous Emission b) Stimulated Emission c) Both (a) and (b) d) None of these (iii) Compression of pulse takes place due to \_\_\_\_ a) Scattering b) Attenuation c) Nonlinearity d) Splicing (iv) Which reason/s is/are responsible for the occurrence of non-linear Cross Phase Modulation (XPM)? a) Difference in transmission phase of peak b) Third-order optical non-linearity pulse & leading or trailing edges of pulse c) Intensity dependence of refractive index d) All of these (v) Given step-index optical fiber parameters n1 = 1.45, n2 = 1.444, core radius = 4.2 ?m, and operating wavelength of 1550 nm, V-number of the fiber is a) 2.73 b) 3.45 c) 2.24 d) 2.91 (vi) Evanescent field coupling is possible a) When V number is very low b) When core radius is very large c) When V number is very high d) When core diameter is very large (vii) The loss in signal power as light travels down a fiber is called a) Dispersion b) Scattering c) Absorption

(viii) When the incidence angle is \_\_\_\_\_\_ the specified critical angle, the light rays bend along the intersection line of two different mediums of propagation.

a) more than

d) Attenuation

b) less than

<ul><li>c) equal to</li><li>(ix) Optical fiber communication operates in the w</li></ul>	d) not related with vavelength band	
<ul> <li>a) 400 μm to 700 μm</li> <li>c) 400 nm to 700 nm</li> <li>(x) Which rays exhibit the variation in the light according</li> </ul>	b) 800 μm to 1600 μm d) 800 nm to 1600 nm	
a) Meridional c) Leaky (xi) Â In optical fiber, the outer layer is	b) Skew d) All of these	
<ul><li>a) core, cladding</li><li>c) reflect, transmit</li><li>(xii) Single mode optical fiber is mainly used for</li></ul>	b) cladding, core d) transmit, reflect	
a) Long haul communication c) Medium haul communication (xiii) The most important property of LASER light is	b) Short haul communication d) None of these	·. •
a) It is a coherent source c) Its beam width is large (xiv) An LED source produces light when	b) It is a non-coherent source d) Its speed is very high	
a) It is reverse biased	<ul> <li>b) Holes and electrons are combined in depletion region</li> </ul>	the
c) The depletion region becomes wider	d) Electrons are emitted from junction	surface
<b>Grou</b> (Short Answer To		3 x 5=15
<ol> <li>Explain NEP (Noise Equivalent Power) of optical detector.</li> <li>Explain how DWDM technique facilitates the optical network</li> <li>Compare the merits and demerits of fiber optic communication system.</li> <li>Explain step index and graded index fiber mentioning their refractive index profile.</li> <li>Prepare a comparative study between stimulated emission and spontaneous emission OR</li> <li>Prepare a comparative study between PIN diode and APD</li> </ol>		(3) (3) (3) (3) (3)
<b>Gro</b> u (Long Answer Ty	-	5 x 6=30
7. Discuss on photonic crystal fiber.		(5)
<ol> <li>A step index fiber has a core with refractive index of 1.55 and a cladding with a refractive (5) index of 1.51. Evaluate the acceptance angle and numerical aperture of the fiber.</li> </ol>		
9. Identify different losses associated with optical fiber.		(5)
10. Explain the amplification mechanism of an EDFA.		(5)
11. A multimode step index fiber with a core diameter of 80 μm and a relative index difference (5) of 1.5% is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48, estimate the normalized frequency and the number of guided modes.		
12. Explain the primary characteristics of light detectors.		(5)

## OR

Write the advantages and drawbacks of laser in comparison with LED for use as a source in (5) optical fiber communication.