

Vidyavardhini's College of Engineering & Technology, Vasai (W)
Department of Electronics & Telecommunication Engineering

Curriculum Scheme: Rev2016

Examination: BE Semester: VII

Course Code: ECC703 and Course Name: Optical Communication

Time: 2 Hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Given step-index optical fiber parameters $n_1 = 1.45$, $n_2 = 1.444$, core radius = 4.2 μm , and operating wavelength of 1310 nm, V-number of the fiber is
Option A:	73
Option B:	2.24
Option C:	2.65
Option D:	2.89
2.	For an electromagnetic wave incident from one medium to a second medium, total reflection takes place when
Option A:	The angle of incidence is equal to the Brewster angle with E field perpendicular to the plane of incidence.
Option B:	The angle of incidence is equal to the critical angle with the wave moving from the denser medium to a rarer medium.
Option C:	The angle of incidence is equal to the Brewster angle with E field parallel to the plane of incidence.
Option D:	The angle of incidence is equal to the critical angle with the wave moving from a rarer medium to a denser medium
3.	Given step-index optical fiber parameters $n_1 = 1.48$, $n_2 = 1.444$, core radius = 4.2 μm , and operating wavelength of 1550 nm, acceptance angle of the fiber is (in degrees),
Option A:	5.21
Option B:	15.14
Option C:	6.04
Option D:	43.60
4.	What is the energy of blue ($\lambda = 400 \text{ nm}$) photons?
Option A:	$79.56 \times 10^{-19} \text{ J}$
Option B:	$4.97 \times 10^{-19} \text{ J}$
Option C:	$1.8 \times 10^{-19} \text{ J}$
Option D:	$8 \times 10^{-19} \text{ J}$
5.	A technique used for determining the total fiber attenuation per unit length is _____ method.
Option A:	Frank
Option B:	Cut-off

Option C:	cut-back
Option D:	Erlangen
6.	Material dispersion is caused by the
Option A:	Wavelength dependence of the index of refraction
Option B:	Wavelength independence of the index of refraction
Option C:	Dependence of the propagation constant on the mode number
Option D:	Independence of the propagation constant on the mode number
7.	The phenomenon when an excited electron jumps from an energy state E_2 to energy state E_1 ($E_2 > E_1$) without any external energy being supplied is called as
Option A:	Absorption
Option B:	Stimulated emission
Option C:	Spontaneous emission
Option D:	None of the above
8.	If an electron jumps from energy state E_2 to E_1 and spontaneously emits a photon of wavelength 1550 nm, the value of $E_2 - E_1$ is
Option A:	0.8 eV
Option B:	0.4 eV
Option C:	1.2 eV
Option D:	Cannot be determined
9.	Nonlinear phase shift due to nonlinear effects in an optical fiber is
Option A:	Directly proportional to input power.
Option B:	Inversely proportional to input power.
Option C:	Independent of input power.
Option D:	None of the above
10.	A lens-coupled surface-emitting LED launches 190 μ W of optical power into a multimode step index fiber when a forward current of 25 mA is flowing through the device. Determine the overall power conversion efficiency when the corresponding forward voltage across the diode is 1.5 V.
Option A:	0.5%.
Option B:	0.7%.
Option C:	0.8%.
Option D:	0.85%.
11.	The light output from the GaAs LED is coupled into a step index fiber with a numerical aperture of 0.2. Find the the coupling efficiency into the fiber.
Option A:	5%
Option B:	6%

Option C:	4%
Option D:	40%
12.	For a photo-diode with responsivity of 0.80 A/W & optical power of about 12 μ W, what would be the value of generated photocurrent?
Option A:	3 μ A
Option B:	9.6 μ A
Option C:	9 μ A
Option D:	12 μ A
13.	The quantum efficiency of a particular silicon RAPD is 80% for the detection of radiation at a wavelength of 0.9 μ m. When the incident optical power is 0.5 μ W, the output current from the device (after avalanche gain) is 11 μ A. Determine the Responsivity of the photodiode under these conditions.
Option A:	0.851 A W ⁻¹
Option B:	0.581 A W ⁻¹
Option C:	0.285 A W ⁻¹
Option D:	0.325 A W ⁻¹
14.	Compute multiplication factor of RAPD with output current of 10 μ A and photocurrent of 0.4 μ A.
Option A:	25
Option B:	27.100
Option C:	43
Option D:	22.2
15.	Determine the output current of RAPD having multiplication factor of 39 and photocurrent of 0.469 μ A.
Option A:	17.21
Option B:	10.32
Option C:	12.21
Option D:	18.29
16.	A device that distributes light from a main fiber into one or more branch fibers.
Option A:	Optical fiber coupler
Option B:	Optical fiber splice
Option C:	Optical fiber connector
Option D:	Optical isolator
17.	Consider the assertions given below. Which is the correct sequential order of process adopted in glass fiber preparation? a. Drawing of fiber b. Production of pure glass c. Pulling of fiber d. Conversion of pure glass into preform

Option A:	B, D, A, C
Option B:	A, B, C, D
Option C:	C, A, D, B
Option D:	D, B, A, C
18.	_____ is a interdisciplinary area that studies the interaction between microwave and optical signals
Option A:	Microwave photonics
Option B:	Wireless Networks
Option C:	Microwave Networks
Option D:	Optical Networks
19.	Link rise time due to LED rise time of 15 ns, material dispersion related rise time of 21 ns, rise time degradation from receiver 14 ns and modal dispersion rise time of 3.9 ns is
Option A:	30 ns
Option B:	40 ns
Option C:	50 ns
Option D:	60 ns
20.	Which kind of dispersion phenomenon gives rise to pulse spreading in single mode fibers?
Option A:	Intramodal
Option B:	Intermodal
Option C:	Material
Option D:	Group Velocity

Q2	Solve any Two Questions out of Three	10 marks each
A	What are the different factors responsible for attenuation and dispersion in optical fiber.	
B	Explain in brief VAD and MCVD fiber fabrication technique.	
C	Explain working principle of EDFA with diagram.	

Q3.	
A	Solve any Two 5 marks each
i.	RF over Fiber
ii.	Solitons
iii.	Quantum Well LASERS
B	Solve any One 10 marks each
i.	Explain in detail working principle of RAPD and differentiate with PIN.
ii.	Explain working of OTDR in detail.