1. Multimode step index fiber has _____
   a) Large core diameter & large numerical aperture
   b) Large core diameter and small numerical aperture
   c) Small core diameter and large numerical aperture
   d) Small core diameter & small numerical aperture
2. A typically structured glass multimode step index fiber shows as variation of attenuation in range of _____
   a) 1.2 to 90 dB km^{-1} at wavelength 0.69μm
   b) 3.2 to 30 dB km^{-1} at wavelength 0.59μm
   c) 2.6 to 50 dB km^{-1} at wavelength 0.85μm
   d) 1.6 to 60 dB km^{-1} at wavelength 0.90μm
3. Multimode step index fiber has a large core diameter of range is _____
   a) 100 to 300 μm
   b) 100 to 300 nm
   c) 200 to 500 μm
   d) 200 to 500 nm
4. Multimode step index fibers have a bandwidth of _____
   a) 2 to 30 MHz km
   b) 6 to 50 MHz km
   c) 10 to 40 MHz km
   d) 8 to 40 MHz km
5. Multimode graded index fibers are manufactured from materials with _____
   a) Lower purity
   b) Higher purity than multimode step index fibers.
   c) No impurity
   d) Impurity as same as multimode step index fibers.
6. The performance characteristics of multimode graded index fibers are _____
   a) Better than multimode step index fibers
   b) Same as multimode step index fibers
   c) Lesser than multimode step index fibers
   d) Negligible
7. Multimode graded index fibers have overall buffer jackets same as multimode step index fibers but have core diameters _____
   a) Larger than multimode step index fibers

b) Smaller than multimode step index fibers
c) Same as that of multimode step index fibers
d) Smaller than single mode step index fibers

8. Multimode graded index fibers with wavelength of 0.85μm have numerical aperture of 0.29 have core/cladding diameter of _____
   a) 62.5 μm/125 μm
   b) 100 μm/140 μm
   c) 85 μm/125 μm
   d) 50 μm/125μm
9. Multimode graded index fibers use incoherent source only.
   a) True
   b) False
10. In single mode fibers, which is the most beneficial index profile?
    a) Step index
    b) Graded index
    c) Step and graded index
    d) Coaxial cable
11. The fibers mostly not used nowadays for optical fiber communication system are _____
    a) Single mode fibers
    b) Multimode step fibers
    c) Coaxial cables
    d) Multimode graded index fibers
12. Single mode fibers allow single mode propagation; the cladding diameter must be at least _____
    a) Twice the core diameter
    b) Thrice the core diameter
    c) Five times the core diameter
    d) Ten times the core diameter
13. A fiber which is referred as non-dispersive shifted fiber is?
    a) Coaxial cables
    b) Standard single mode fibers
    c) Standard multimode fibers
    d) Non zero dispersion shifted fibers
14. Standard single mode fibers (SSMF) are utilized mainly for operation in _____

a) C-band
b) L-band
c) O-band
d) C-band and L-band

15. Fiber mostly suited in single-wavelength transmission in O-band is?
a) Low-water-peak non dispersion-shifted fibers
b) Standard single mode fibers
c) Low minimized fibers
d) Non-zero-dispersion-shifted fibers

16. When optical fibers are to be installed in a working environment, the most important parameter to be considered is?
a) Transmission property of the fiber
b) Mechanical property of the fiber
c) Core cladding ratio of the fiber
d) Numerical aperture of the fiber

17. Optical fibers for communication use are mostly fabricated from _____
a) Plastic
b) Silica or multicomponent glass
c) Ceramics
d) Copper

18. _____ results from small lateral forces exerted on the fiber during the cabling process.
a) Attenuation
b) Micro-bending
c) Dispersion
d) Stimulated Emission

19. Microscopic meandering of the fiber core axis that is micro-bending is caused due to _____
a) Environmental effects
b) Rough edges of the fiber
c) Large diameter of core
d) Polarization

20. What does micro-bending losses depend on _____
a) Core material
b) Refractive index

c) Diameter

d) Mode and wavelength

21. The fiber should be_____to avoid deterioration of the optical transmission characteristics resulting from mode-coupling-induced micro-bending.

a) Free from irregular external pressure

b) Coupled with plastic

c) Large in diameter

d) Smooth and in a steady state

22. The diffusion of hydrogen into optical fiber affects the _____

a) Transmission of optical light in the fiber

b) Spectral attenuation characteristics of the fiber

c) Core of the fiber

d) Cladding of the fiber

23. _____ can induce a considerable amount of attenuation in optical fibers.

a) Micro-bending

b) Dispersion

c) Diffusion of hydrogen

d) Radiation Exposure

24. The ratio r = (n1 – n)/(n1 – n) indicates _____

a) Fresnel reflection

b) Reflection coefficient

c) Refraction coefficient

d) Angular power distribution coefficient

25. Losses caused by factors such as core-cladding diameter, numerical aperture, relative refractive index differences, different refractive index profiles, fiber faults are known as _____

a) Intrinsic joint losses

b) Extrinsic losses

c) Insertion losses

d) Coupling losses

26. A step index fiber has a coupling efficiency of 0.906 with uniform illumination of all propagation modes. Find the insertion loss due to lateral misalignment?

a) 0.95 dB

b) 0.40 dB

c) 0.42 dB

d) 0.62 Db

$Loss_{10t} = -10\log_{10t} \eta_{10t}$

Where, $Loss_{10t}$ = insertion loss due to lateral misalignment

η_{10t} = Coupling efficiency.

27. A graded index fiber has a parabolic refractive index profile (α=2) and core diameter of 42μm. Estimate an insertion loss due to a 2 μm lateral misalignment when there is index matching and assuming there is uniform illumination of all guided modes only.

a) 0.180

b) 0.106

c) 0.280

d) 0.080

$L_t = 0.85(y/a)$

Where y = lateral misalignment

a = core radius.

28. In a single mode fiber, the losses due to lateral offset and angular misalignment are given by 0.20 dB and 0.46 dB respectively. Find the total insertion loss.

a) 0.66 dB

b) 0.26 dB

c) 0.38 dB

d) 0.40 dB

$T_T = T_L + T_a$

Where, T_T = total insertion loss

T_L = lateral offset loss

T_a = Angular misalignment loss.

29. A permanent joint formed between two different optical fibers in the field is known as a _____

a) Fiber splice

b) Fiber connector

c) Fiber attenuator

d) Fiber dispersion

30. The insertion losses of the fiber splices are much less than the Fresnel reflection loss at a butted fiber joint.

a) True

b) False

31. The heating of the two prepared fiber ends to their fusing point with the application of required axial pressure between the two optical fibers is called as _____
    a) Mechanical splicing
    b) Fusion splicing
    c) Melting
    d) Diffusion
32. Average insertion losses as low as _____have been obtained with multimode graded index and single-mode fibers using ceramic capillaries.
    a) 0.1 dB
    b) 0.5 dB
    c) 0.02 dB
    d) 0.3 dB
33. _____ are formed by sandwiching the butted fiber ends between a V-groove glass substrate and a flat glass retainer plate.
    a) Springroove splices
    b) V-groove splices
    c) Elastic splices
    d) Fusion splices
34. When considering source-to-fiber coupling efficiencies, the _____ is an important parameter than total output power.
    a) Numerical aperture
    b) Radiance of an optical source
    c) Coupling efficiency
    d) Angular power distribution
35. It is a device that distributes light from a main fiber into one or more branch fibers.
    a) Optical fiber coupler
    b) Optical fiber splice
    c) Optical fiber connector
    d) Optical isolator
36. Optical fiber couplers are also called as _____
    a) Isolators
    b) Circulators
    c) Directional couplers
    d) Attenuators

37. The optical power coupled from one fiber to another is limited by _____
    a) Numerical apertures of fibers
    b) Varying refractive index of fibers
    c) Angular power distribution at source
    d) Number of modes propagating in each fiber
38. _____ couplers combine the different wavelength optical signal onto the fiber or separate the different wavelength optical signal output from the fiber.
    a) 3-port
    b) 2*2-star
    c) WDM
    d) Directional
39. Which is the most common method for manufacturing couplers?
    a) Wavelength division multiplexing
    b) Lateral offset method
    c) Semitransparent mirror method
    d) Fused bi-conical taper (FBT) technique
40. A four-port multimode fiber FBT coupler has 50 μW optical power launched into port 1. The measured output power at ports 2,3 and 4 are 0.003, 23.0 and 24.5 μW respectively. Determine the excess loss.
    a) 0.22 dB
    b) 0.33 dB
    c) 0.45 dB
    d) 0.12 dB
    Excess loss = $10\log_{10} P_1/(P_3+P_4)$
    Where P_1, P_3, P_4 = output power at ports 1,3 and 4 resp.
41. A four-port FBT coupler has 60μW optical power launched into port one. The output powers at ports 2, 3, 4 are 0.0025, 18, and 22 μW respectively. Find the split ratio?
    a) 42%
    b) 46%
    c) 52%
    d) 45%
    Split ratio = $[P_3/(P_3+P_4)]*100\%$
    Where P_3 and P_4 are output powers at ports 3 and 4 respectively.
42. Calculate the splitting loss if a 30×30 port multimode fiber star coupler has 1 mW of optical power launched into an input port.

a) 13 dB
b) 15 dB
c) 14.77 dB
d) 16.02 dB
Splitting loss (Star coupler) = $10\log_{10}N$ (dB).

43. A number of three-port single-mode fiber couplers are used in the fabrication of a ladder coupler with 16 output ports. The three-port couplers each have an excess loss of 0.2 dB along with a splice loss of 0.1 dB at the interconnection of each stage. Determine the excess loss.
a) 1.9 dB
b) 1.4 dB
c) 0.9 dB
d) 1.1 dB
Excess loss = (M×loss in each 3-port coupler) + (Number of splices×Loss in each stage)
Where number of splices = 3 (as the value of M is equal to 4).

44. A device which is made of isolators and follows a closed loop path is called as a _____
a) Circulator
b) Gyrator
c) Attenuator
d) Connector

45. The commercially available circulators exhibit insertion losses around _____
a) 2 dB
b) 0.7 dB
c) 0.2 dB
d) 1 dB

46. A device which converts electrical energy in the form of a current into optical energy is called as _____
a) Optical source
b) Optical coupler
c) Optical isolator
d) Circulator

47. How many types of sources of optical light are available?
a) One

b) Two

c) Three

d) Four

48. The frequency of the absorbed or emitted radiation is related to difference in energy E between the higher energy state E_2 and the lower energy state E_1. State what h stands for in the given equation?

$E = E_2 - E_1 = hf$

a)Gravitation constant

b) Planck's constant

c) Permittivity

d) Attenuation constant

49. The radiation emission process (emission of a proton at frequency) can occur in _____ ways.

a) Two

b) Three

c) Four

d) One

50. An incandescent lamp is operating at a temperature of 1000K at an operating frequency of 5.2×10^{14} Hz. Calculate the ratio of stimulated emission rate to spontaneous emission rate.

a) 3×10^{-13}

b) 1.47×10^{-11}

c) 2×10^{-12}

d) 1.5×10^{-13}

Stimulated emission rate/ Spontaneous emission rate = 1/exp (hf/KT)-1.

51. The lower energy level contains more atoms than upper level under the conditions of _____

a) Isothermal packaging

b) Population inversion

c) Thermal equilibrium

d) Pumping

52. _____ in the laser occurs when photon colliding with an excited atom causes the stimulated emission of a second photon.

a) Light amplification

b) Attenuation

c) Dispersion

d) Population inversion

53. A ruby laser has a crystal of length 3 cm with a refractive index of 1.60, wavelength 0.43 μm. Determine the number of longitudinal modes.
    a) 1×10^{2}
    b) 3×10^{6}
    c) 2.9×10^{5}
    d) 2.2×10^{5}
    $q = 2nL/\lambda$
    Where
    q = Number of longitudinal modes
    n = Refractive index
    L = Length of the crystal
    λ = Peak emission wavelength.
54. A semiconductor laser crystal of length 5 cm, refractive index 1.8 is used as an optical source. Determine the frequency separation of the modes.
    a) 2.8 GHz
    b) 1.2 GHz
    c) 1.6 GHz
    d) 2 GHz
    $\delta f = c/2nL$
    Where
    c = velocity of light
    n = Refractive index
    L = Length of the crystal.
55. A perfect semiconductor crystal containing no impurities or lattice defects is called as _____
    a) Intrinsic semiconductor
    b) Extrinsic semiconductor
    c) Excitation
    d) Valence electron
56. The energy-level occupation for a semiconductor in thermal equilibrium is described by the _____
    a) Boltzmann distribution function
    b) Probability distribution function
    c) Fermi-Dirac distribution function
    d) Cumulative distribution function

57. What is done to create an extrinsic semiconductor?
    a) Refractive index is decreased
    b) Doping the material with impurities
    c) Increase the band-gap of the material
    d) Stimulated emission
58. The majority of the carriers in a p-type semiconductor are _____
    a) Holes
    b) Electrons
    c) Photons
    d) Neutrons
59. _____ is used when the optical emission results from the application of electric field.
    a) Radiation
    b) Efficiency
    c) Electro-luminescence
    d) Magnetron oscillator
60. How many types of hetero-junctions are available?
    a) Two
    b) One
    c) Three
    d) Four
61. The _____system is best developed and is used for fabricating both lasers and LEDs for the shorter wavelength region.
    a) InP
    b) GaSb
    c) GaAs/GaSb
    d) GaAs/Alga AS DH
62. P-n photodiode is forward biased.
    a) True
    b) False
63. The depletion region must be _____ to allow a large fraction of the incident light to be absorbed in the device(photodiode).
    a) Thick
    b) Thin
    c) Long
    d) Inactive

64. The process of excitation of an electron from valence band to conduction band leaves an empty hole in the valence band and is called as _____
    a) Detection
    b) Absorption
    c) Degeneration of an electron-hole pair
    d) Regeneration of an electron-hole pair
65. _____ always leads to the generation of a hole and an electron.
    a) Repulsion
    b) Dispersion
    c) Absorption
    d) Attenuation
66. The electron hole pairs generated in a photodiode are separated by the _____
    a) Magnetic field
    b) Electric field
    c) Static field
    d) Depletion region
67. The photocurrent of an optical detector should be _____
    a) Less
    b) More
    c) Linear
    d) Non-linear
68. How many types of optical detectors are available?
    a) One
    b) Four
    c) Two
    d) Three
69. The absorption of photons in a photodiode is dependent on _____
    a) Absorption Coefficient α_0
    b) Properties of material
    c) Charge carrier at junction
    d) Amount of light
70. The photocurrent in a photodiode is directly proportional to absorption coefficient.
    a) True
    b) False

71. The absorption coefficient of semiconductor materials is strongly dependent on _____
    a) Properties of material
    b) Wavelength
    c) Amount of light
    d) Amplitude
72. In optical fiber communication, the only weakly absorbing material over wavelength band required is?
    a) GaAs
    b) Silicon
    c) GaSb
    d) Germanium
73. The threshold for indirect absorption occurs at wavelength _____
    a) 3.01 μm
    b) 2.09 μm
    c) 0.92 μm
    d) 1.09 μm
74. The semiconductor material for which the lowest energy absorption takes place is?
    a) GaAs
    b) Silicon
    c) GaSb
    d) Germanium
75. The wavelength range of interest for Germanium is _____
    a) 0.8 to 1.6 μm
    b) 0.3 to 0.9 μm
    c) 0.4 to 0.8 μm
    d) 0.9 to 1.8 μm
76. A photodiode should be chosen with a _____ less than photon energy.
    a) Direct absorption
    b) Band gap energy
    c) Wavelength range
    d) Absorption coefficient
77. _____ photodiodes have large dark currents.
    a) GaAs
    b) Silicon

c) GaSb

d) Germanium

78. For fabrication of semiconductor photodiodes, there is a drawback while considering _____

a) GaAs

b) Silicon

c) GaSb

d) Germanium

79. _____ materials are potentially superior to germanium.

a) GaAs

b) Silicon

c) GaSb

d) III – V alloys

80. _____ alloys such as InGaAsP and GaAsSb deposited on InP and GaSb substrate.

a) Ternary

b) Quaternary

c) Gain-guided

d) III – V alloys

81. _____ alloys can be fabricated in hetero-junction structures.

a) InGaSb

b) III – V alloys

c) InGaAsP

d) GaAsSb

82. The alloys lattice matched to InP responds to wavelengths up to 1.7μm is?

a) InAsSb

b) III – V alloys

c) InGaSb

d) InGaAs

83. The fraction of incident photons generated by photodiode of electrons generated collected at detector is known as _____

a) Quantum efficiency

b) Absorption coefficient

c) Responsivity

d) Anger recombination

84. In photo detectors, energy of incident photons must be _____ band gap energy.
    a) Lesser than
    b) Greater than
    c) Same as
    d) Negligible
85. GaAs has band gap energy of 1.93 eV at 300 K. Determine wavelength above which material will cease to operate.
    a) $2.431*10^{-5}$
    b) $6.424*10^{-7}$
    c) $6.023*10^{3}$
    d) $7.234*10^{-7}$
    The long wavelength cutoff is given by
    $\lambda_c = hc/Eg = 6.6268*10^{-34}*2.998*10^{8}/1.93*1.602*10^{-19}$
    $= 6.424*10^{-7}\mu m.$
86. The long cutoff wavelength of GaAs is 0.923 μm. Determine bandgap energy.
    a) $1.478*10^{-7}$
    b) $4.265*10^{-14}$
    c) $2.784*10^{-9}$
    d) $2.152*10^{-19}$
    $\lambda_c = hc/Eg$
    $Eg = hc/\lambda_c = 6.6268*10^{-34}*2.998*10^{8}/0.923*10^{-6}$
    $= 2.152*10^{-19}eV.$
87. Quantum efficiency is a function of photon wavelength.
    a) True
    b) False

88. Determine quantum efficiency if incident photons on photodiodes is $4*10^{11}$ and electrons collected at terminals is $1.5*10^{11}$?
    a) 50%
    b) 37.5%
    c) 25%
    d) 30%
    Explanation: Quantum efficiency is given by
    Quantum Efficiency = No. of electrons collected/No. of incident photons
    = $1.5*10^{11}/4*10^{11}$
    = 0.375 * 100
    = 37.5%.
89. A photodiode has quantum efficiency of 45% and incident photons are $3*10^{11}$. Determine electrons collected at terminals of device.
    a) $2.456*10^{9}$
    b) $1.35*10^{11}$
    c) $5.245*10^{-7}$
    d) $4.21*10^{-3}$
    Explanation: Quantum efficiency is given by
    Quantum efficiency = No. of electrons collected/No. of incident photons
    Electrons collected = Quantum efficiency * number of incident photons
    = 45/100 * $3*10^{11}$
    = $1.35*10^{11}$.
90. The quantum efficiency of photodiode is 40% with wavelength of $0.90*10^{-6}$. Determine the responsivity of photodiodes.
    a) 0.20
    b) 0.52
    c) 0.29
    d) 0.55
    Explanation: Responsivity of photodiodes is given by
    $R = \eta e \lambda/hc$
    = $0.4*1.602*10^{-19} * 0.90*10^{-6}/6.626*10^{-34} * 3*10^{8}$
    = 0.29 AW^{-1}.

91. The Responsivity of photodiode is 0.294 AW^{-1} at wavelength of 0.90 μm. Determine quantum efficiency.
    a) 0.405
    b) 0.914
    c) 0.654
    d) 0.249
    Explanation: Responsivity of photodiode is
    R = ηe λ/hc
    η = RXhc/eλ
    = $0.294*6.626*10^{-34}*3*10^{8}/ 1.602*10^{-19}*0.90*10^{8}$
    = 0.405 AW^{-1}.
92. Determine wavelength of photodiode having quantum efficiency of 40% and Responsivity of 0.304 AW^{-1}.
    a) 0.87 μm
    b) 0.91 μm
    c) 0.88 μm
    d) 0.94 μm
    The Responsivity of photodiode is
    R = ηe λ/hc
    λ = Rhc/ηe
    = $0.304*6.626*10^{-34}*3*10^{8}/0.4*1.602*10^{-19}$
    = 0.94 μm.
93. Determine wavelength at which photodiode is operating if energy of photons is $1.9*10^{-19}$J?
    a) 2.33
    b) 1.48
    c) 1.04
    d) 3.91
    Explanation: To determine wavelength,
    λ = hc/t
    = $6.626*10^{-34}*3*10^{8}/1.9*10^{-19}$
    = 1.04 μm
94. Determine the energy of photons incident on a photodiode if it operates at a wavelength of 1.36 μm.
    a) $1.22*10^{-34}$J

b) $1.46*10^{-19}$J

c) $6.45*10^{-34}$J

d) $3.12*10^{9}$J

Explanation: The wavelength of photodiode is given by

$\lambda = hc/t$

$E = hc/\lambda$

$= 6.626*10^{-34}*3*10^{8}/1.36*10^{-6}$

$= 1.46*10^{-19}$J.

95. Determine Responsivity of photodiode having o/p power of 3.55 μm and photo current of 2.9 μm.

a) 0.451

b) 0.367

c) 0.982

d) 0.816

Explanation: The Responsivity of photodiode is

$R = Ip/Po$

$= 2.9*10^{-6}/3.55*10^{-6}$

= 0.816 A/W.

96. Determine incident optical power on a photodiode if it has photocurrent of 2.1 μA and responsivity of 0.55 A/W.

a) 4.15

b) 1.75

c) 3.81

d) 8.47

Explanation: The Responsivity of photodiode is

$R = Ip/Po$

$Po = Ip/R$

$= 2.1*10^{-6}/0.55$

= 3.81 μm.

97. If a photodiode requires incident optical power of 0.70 A/W. Determine photocurrent.

a) 1.482

b) 2.457

c) 4.124

d) 3.199

Explanation: The Responsivity of photodiode is given by

R = Ip/Po

Ip = R*Po

= $0.70*3.51*10^{-6}$

= 2.457μm.

98. _____ refers to any spurious or undesired disturbances that mask the received signal in a communication system.

a) Attenuation

b) Noise

c) Dispersion

d) Bandwidth

99. _____ is caused due to thermal interaction between the free electrons and the vibrating ions in the conduction medium.

a) Thermal noise

b) Dark noise

c) Quantum noise

d) Gaussian noise

100. A digital optical fiber communication system requires a maximum bit-error-rate of 10^{-9}. Find the average number of photons detected in a time period for a given BER.

a) 19.7

b) 21.2

c) 20.7

d) 26.2

Explanation: The probability of error is given by-

$P(e) = \exp(-Z_m)$

Where, Z_m = No. of photons

Here $P(e) = 10^{-9}$, therefore Z_m is calculated from above relation.

101. For a given optical fiber communication system, $P(e) = 10^{-9}$, $Z_m = 20.7$, $f = 2.9\times10^{14}$, $\eta = 1$. Find the minimum pulse energy or quantum limit.

a) 3.9×10^{-18}

b) 4.2×10^{-18}

c) 6.2×10^{-14}

d) 7.2×10^{-14}

Explanation: The minimum pulse energy or quantum limit is given by –

$E_{min} = Z_m hf/\eta$

Where, Z_m = Number of photons

h = Planck's constant

f = frequency

η = Quantum efficiency.

102. An analog optical fiber system operating at wavelength 1μmhas a post-detection bandwidth of 5MHz. Assuming an ideal detector and incident power of 198 nW, calculate the SNR ($f = 2.99\times10^{14}$Hz).

a) 46

b) 40

c) 50

d) 52

Explanation: The SNR is given by –

$S/N = \eta P_0/2hfB$

Where, η = 1 (for ideal detector)

P_0 = incident power

h = Planck's constant

B = Bandwidth.

103. The incident optical power required to achieve a desirable SNR is 168.2nW. What is the value of incident power in dBm?

a) -37.7 dBm

b) -37 dBm

c) – 34 dBm

d) -38.2 dBm

Explanation: Incident power in denoted by P_0. It is given by –

$P_0 = 10\log_{10}(P_0(watts))$

Where P_0(watts) = incident power in Watts/milliWatt.

104. Which are the two main sources of noise in photodiodes without internal gain?

a) Gaussian noise and dark current noise

b) Internal noise and external noise

c) Dark current noise & Quantum noise

d) Gaussian noise and Quantum noise

105. The dominating effect of thermal noise over the shot noise in photodiodes without internal gain can be observed in wideband systems operating in the range of _____

a) 0.4 to 0.5 μm

b) 0.8 to 0.9 μm
c) 0.3 to 0.4 μm
d) 0.7 to 0.79 μm

106. A silicon p-i-n photodiode incorporated in an optical receiver has following parameters:

Quantum efficiency = 70%

Wavelength = 0.8 μm

Dark current = 3nA

Load resistance = 4 kΩ

Incident optical power = 150nW.

Bandwidth = 5 MHz

Compute the photocurrent in the device.

Compute the photocurrent in the device.
a) 67.7nA
b) 81.2nA
c) 68.35nA
d) 46.1nA

Explanation: The photocurrent is given by
$I_p = \eta P_0 e\lambda/hc$
Where η = Quantum efficiency
P_0 = Incident optical power
e = electron charge
λ = Wavelength
h = Planck's constant
c = Velocity of light.

107. In a silicon p-i-n photodiode, if load resistance is 4 kΩ, temperature is 293 K, bandwidth is 4MHz, find the thermal noise in the load resistor.
a) $1.8 \times 10^{-16} A^2$
b) $1.23 \times 10^{-17} A^2$
c) $1.65 \times 10^{-16} A^2$
d) $1.61 \times 10^{-17} A^2$

Explanation: The thermal noise in the load resistor is given by –
$i_t^2 = 4KTB/R_L$
Where T = Temperature
B = Bandwidth
R_L = Load resistance.

108. A photodiode has a capacitance of 6 pF. Calculate the maximum load resistance which allows an 8MHz post detection bandwidth.
a) 3.9 kΩ
b) 3.46 kΩ
c) 3.12 kΩ
d) 3.32 kΩ

Explanation: The load resistance is given by-
$R_L = 1/2\pi C_d B$
Where
B = Post detection bandwidth
C_d = Input capacitance
R_L = Load resistance.

109. The internal gain mechanism in an APD is directly related to SNR. State whether the given statement is true or false.
a) True
b) False

110. _____ is dependent upon the detector material, the shape of the electric field profile within the device.
a) SNR
b) Excess avalanche noise factor
c) Noise gradient

111. For silicon APDs, the value of excess noise factor is between _____
a) 0.001 and 0.002
b) 0.5 and 0.7
c) 0.02 and 0.10
d) 1 and 2

112. How many design considerations are considered while determining the receiver performance?
a) Three
b) Two
c) One
d) Four

113. FET preamplifiers provide higher sensitivity than the Si-bipolar device.
a) True
b) False

114. What is the abbreviation of HBT?
a) Homo-junction unipolar transistor
b) Homo-junction bipolar transistor
c) Hetero-junction bipolar transistor
d) Hetero-Bandwidth transcendence

115. What type of receivers are used to provide wideband operation, low-noise operation?
a) APD optical receivers
b) Optoelectronic integrated circuits (OEICs)
c) MESFET receivers
d) Trans-impedance front-end receivers

116. _____ circuits extends the dynamic range of the receiver.
a) Monolithic
b) Trans-impedance
c) Automatic Error Control (AEC)
d) Automatic Gain Control (AGC)

117. What is generally used to determine the receiver performance characteristics?
a) Noise

b) Resistor
c) Dynamic range & sensitivity characteristics
d) Impedance

118. The _____ technique eliminates the thermal noise associated with the feedback resistor in the trans-impedance front end design.
a) Compensation
b) Resonating impedance
c) Electromagnetic
d) Optical feedback

119. The removal of the feedback resistor in the optical feedback technique allows reciever sensitivity of the order of _____
a) -54 dB_m at 2Mbit/sec
b) -12 dB_m at 2Mbit/sec
c) -64 dB_m at 2Mbit/sec
d) -72 dB_m at 2Mbit/sec

120. The optimum filter bandwidth is typically in the range _____
a) 0.1 to 0.3 nm
b) 0.5 to 3 nm
c) 0.1 to 0.3 μm
d) 0.5 to 3 μm

121. For linear as well as in nonlinear mode _____ are most important network elements.
a) Optical amplifier
b) Optical detector
c) A/D converter
d) D/A converters

122. The more advantages optical amplifier is _____
a) Fiber amplifier
b) Semiconductor amplifier
c) Repeaters
d) Mode hooping amplifier

123. _____ cannot be used for wideband amplification.
a) Semiconductor optical amplifier
b) Erbium-doped fiber amplifier
c) Raman fiber amplifier
d) Brillouin fiber amplifier

124. _____ is used preferably for channel selection in a WDM system.
a) Semiconductor optical amplifier
b) Erbium-doped fiber amplifier
c) Raman fiber amplifier
d) Brillouin fiber amplifier

125. For used in single-mode fiber _____ are used preferably.
a) Semiconductor optical amplifier
b) Erbium-doped fiber amplifier
c) Raman fiber amplifier
d) Brillouin fiber amplifier

126. Mostly _____ are used in nonlinear applications.
a) Semiconductor optical amplifier
b) Erbium-doped fiber amplifier
c) Raman fiber amplifier
d) FPAs

127. _____ is superior as compared to _____
a) TWA, FPA
b) FPA, TWA
c) EDFA, FPA
d) FPA, EDFA

128. An uncoated FPA has peak gain wavelength 1.8μm, mode spacing of 0.8nm, and long active region of 300 v. Determine RI of active medium.
a) 4.25×10^{6}
b) 3.75×10^{7}
c) 3.95×10^{7}
d) 4.25×10^{9}

Explanation: $n=\lambda^2/2\delta\lambda L=1.8\times10^{-6}/2\times0.8\times10^{-9}\times300\times10^{-6}=3.75\times10^{7}$.

129. Determine the peak gain wavelength of uncoated FPA having mode spacing of 2nm,and 250μmlong active region and R.I of 3.78.

a)2.25×10^{-4}

b)4.53×10^{-8}

c)1.94×10^{-6}

d)4.25×10^{9}

Explanation: The peak gain wavelength is given by

$\lambda^2=n2\delta\lambda L=3.78\times2\times2\times10^{-9}\times250\times10^{-6}=1.94\times10^{-6}$m.

130. An SOA has net gain coefficient of 300, at a gain of 30dB. Determine length of SOA.

a) 0.32 m

b) 0.023 m

c) 0.245 m

d) 0.563 m

Explanation: The length of SOA is determined by

$L = G_s(dB)/10\times g\times\log_e = 30/10\times300\times0.434$ ` = 0.023 m.

131. An SOA has length of 35.43×10^{-3}m, at 30 dB gain. Determine net gain coefficient.

a) 5.124×10^{-3}

b) 1.12×10^{-4}

c) 5.125×10^{-3}

d) 2.15×10^{-5}

132. An SOA has mode number of 2.6, spontaneous emission factor of 4, optical bandwidth of 1 THz. Determine noise power spectral density.

a) 1.33×10^{-3}

b) 5.13×10^{12}

c) 3.29×10^{-6}

d) 0.33×10^{-9}

Explanation: The noise power spectral density P_{ast} is

$P_{ast} = mn_{sp}(G_s-1)$ hfb

$= 2.6\times4(1000-1)\times6.63\times10^{-34}\times1.94\times10^{14}\times1\times10^{12}$

$= 1.33\times10^{-3}$W.

133. An SOA has noise power spectral density of 1.18mW, spontaneous emission factor of 4, optical bandwidth of 1.5 THz. Determine mode number.

a) 1.53×10^{28}

b) 6.14×10^{12}

c) 1.78×10^{16}

d) 4.12×10^{-3}

Explanation: The mode number is determined by

$m = P_{ast}/n_{sp}(Gs-1)\ hfB$

$= 1.18\times10^{-3}/4(1000-1)\times6.63\times10^{-34}\times1.94\times10^{14}\times1.3\times10^{12}$

$= 1.53 \times 10^{-}$

MCQs on BCS

1. Founded the wave theory of light

a. Francesco Grimaldi

b. Edward Appleton

c. James Clerk Maxwell

d. Christian Huygens

View Answer:
Answer: **Option D**

Solution:

2. Proposed the use of clad glass fiber as a dielectric waveguide

a. Karpon and Keck

b. Karpon and Bockham

c. Bockham and Kao

d. Kao and Keck

View Answer:
Answer: **Option C**

Solution:

3. Developed the first laser

a. Charles Townes

b. Theodore Maiman

c. Gordon McKenzie

d. Albert Einstein

View Answer:

Answer: **Option B**

Solution:

4. The band of light wavelengths that are too long to be seen by the human eye

a. Amber

b. Visible

c. Infrared

d. Ultraviolet

View Answer:
Answer: **Option C**

Solution:

5. The band of light wavelengths that are too short to be seen by the human eye

a. Amber

b. Visible

c. Infrared

d. Ultraviolet

View Answer:
Answer: **Option C**

Solution:

6. Which color has the shortest wavelength of light?

a. Red

b. Yellow

c. Blue

d. Green

View Answer:
Answer: **Option C**

Solution:

7. What generates a light beam of a specific visible frequency?

a. Laser

b. Maser

c. Infrared

d. Flashlight

View Answer:
Answer: **Option A**

Solution:

8. Which of the following materials is sensitive to light?

a. Photoresist

b. Photosensitive

c. Light Sensitive

d. Maser

View Answer:
Answer: **Option A**

Solution:

9. The core of an optical fiber has a

a. Lower refracted index than air

b. Lower refractive index than the cladding

c. Higher refractive index than the cladding

d. Similar refractive index with the cladding

View Answer:
Answer: **Option C**

Solution:

10. Is the different angle of entry of light into an optical fiber when the diameter of the core is many times the wavelength of the light transmitted.

a. Acceptance angle

b. Modes

c. Sensors

d. Aperture

View Answer:
Answer: **Option B**

Solution:

11. The loss in signal power as light travels down a fiber is called

a. Dispersion

b. Scattering

c. Absorption

d. Attenuation

View Answer:
Answer: **Option D**

Solution:

12. The bandwidth of optical fiber

a. 900M Hz

b. 900 PHz

c. 900 THz

d. 900 EHz

View Answer:
Answer: **Option C**

Solution:

13. If a mirror is used to reflect light, the reflected light angle is ____ as the incident angle

a. Smaller

b. Larger

c. The same

d. Independent

View Answer:
Answer: **Option C**

Solution:

14. What is a specific path the light takes in an optical fiber corresponding to a certain angle and number of reflection

a. Mode

b. Grade

c. Numerical Aperture

d. Dispersion

View Answer:
Answer: **Option A**

Solution:

15. Is the width of the range of wavelengths emitted by the light source

a. Bandwidth

b. Chromatic Dispersion

c. Spectral width

d. Beamwidth

View Answer:
Answer: **Option C**

Solution:

16. Which theory states that the light wave behaves as if it consists of many tiny particles?

a. Huygen's theory

b. Wave theory of light

c. Nyquist theory

d. Quantum theory

View Answer:
Answer: **Option D**

Solution:

17. Fiber optic cables operate at frequencies near

a. 20 MHz

b. 200 MHz

c. 2G Hz

d. 800 THz

View Answer:

Answer: **Option D**

Solution:

18. When a beam of light enters one medium from another, which quantity will not change?

a. Direction

b. Speed

c. Frequency

d. Wavelength

View Answer:
Answer: **Option C**

Solution:

19. Dispersion is used to describe the

a. Splitting of white light into its component colors

b. Propagation of light in straight lines

c. Bending of a beam of light when it goes from one medium to another

d. Bending of a beam light when it strikes a mirror

View Answer:
Answer: **Option A**

Solution:

20. Luminance efficiency is minimum for a

a. Fluorescent tube

b. High wattage light bulb

c. Mercury vapor lamp

d. Low wattage light bulb

View Answer:
Answer: **Option D**

Solution:

21. An object farther from a converging lens than its focal point always has a/an _____ image.

a. Inverted

b. The same in size

c. Virtual

d. Smaller size

View Answer:
Answer: **Option A**

Solution:

22. An object nearer to a converging lens than its focal point always has a/an _____ image.

a. Inverted

b. The same in size

c. Virtual

d. Smaller size

View Answer:
Answer: **Option C**

Solution:

23. The real image formed by a spherical mirror is ____ relative to its object

a. Erect

b. Inverted

c. Smaller

d. Larger

View Answer:
Answer: **Option D**

Solution:

24. The wavelength of light has no role in

a. Diffraction

b. Interference

c. Polarization

d. Reflection

View Answer:
Answer: **Option C**

Solution:

25. Longitudinal waves do not exhibit

a. Polarization

b. Refraction

c. Reflection

d. Diffraction

View Answer:
Answer: **Option A**

Solution:

26. _____ dispersion is caused by the difference in the propagation times of light rays that take different paths down a fiber.

a. Material dispersion

b. Wavelength dispersion

c. Modal dispersion

d. Delay dispersion

View Answer:
Answer: **Option C**

Solution:

27. What is the average insertion loss of fusion splice in fiber optics?

a. 0.09 dB

b. 0.9 dB

c. 0.19 dB

d. 0.009 dB

View Answer:
Answer: **Option A**

Solution:

28. What is the insertion loss of connector-type splices for a single mode fiber optics?

a. 0.51 dB

b. 0.31 dB

c. 0.49 dB

d. 0.38 dB

View Answer:

Answer: **Option D**

Solution:

29. What is the lifetime of LEDs?

a. 200,000 minutes

b. 200,000 hours

c. 150,000 minutes

d. 150,000 hours

View Answer:
Answer: **Option B**

Solution:

30. What is the lifetime of ILDs?

a. 50,000 hours

b. 75,000 hours

c. 100,000 hours

d. 125,000 hours

View Answer:
Answer: **Option A**

Solution:

31. Photodiodes used as fiber optic directors are

a. Unbiased to generate a voltage same as a solar cell

b. Forward bias

c. Reversed bias

d. Thermoelectrically cooled

View Answer:
Answer: **Option C**

Solution:

32. What type of fiber has the highest modal dispersion?

a. Step-index multimode

b. Graded index multimode

c. Step-index single mode

d. Graded index mode

View Answer:
Answer: **Option A**

Solution:

33. Laser light is _____ emission.

a. Coherent

b. Stimulated

c. Spontaneous

d. Coherent and stimulated

View Answer:
Answer: **Option D**

Solution:

34. A dielectric waveguide for the propagation of electromagnetic energy at light frequencies

a. Stripline

b. Microstrip

c. Laser beam

d. Fiber optics

View Answer:
Answer: **Option D**

Solution:

35. Is a non-coherent light source foe optical communications system.

a. ILD

b. LED

c. APD

d. PIN Diode

View Answer:
Answer: **Option B**

Solution:

36. Which type of laser is the simplest to modulate directly by changing its excitation?

a. Semiconductor

b. Ruby

c. Helium-neon

d. Neodymium-YAG

View Answer:
Answer: **Option A**

Solution:

37. Which laser emits light in the visible range 400 to 700 nm?

a. Argon-ion

b. Nitrogen

c. Carbon-dioxide

d. Neodymium-YAG

View Answer:
Answer: **Option A**

Solution:

38. Which is the proper measurement of average power emitted by a pulsed laser?

a. Energy x time

b. Pulse energy x repetition rate

c. Pulse energy / repetition rate

d. Peak power x pulse length

View Answer:
Answer: **Option B**

Solution:

39. What is the photon energy for an infrared wave with frequency of 10^12 Hz?

a. 10.6 x 10^34 joules

b. 6.63 x 10^-34 joules

c. 6.63 x 10^-22 joules

d. 10.6 x 10^22 joules

View Answer:
Answer: **Option C**

Solution:

40. A positive lens with a focal length of 10 cm forms a real image of an object 20 cm away from the lens. How far is the real image from the lens?

a. 5 cm

b. 10 cm

c. 15 cm

d. 20 cm

View Answer:
Answer: **Option D**

Solution:

41. Which of the following factor does not harm laser efficiency?

a. Atmospheric absorption

b. Excitation energy not absorbed

c. Problems in depopulating the lower laser level

d. Inefficiency in populating the upper laser level

View Answer:
Answer: **Option A**

Solution:

42. Which of the following contributes to the broadening of laser emission bandwidth?

a. Doppler shift of moving atoms and molecules

b. Amplification within the laser medium

c. Coherence of the laser light

d. Optical pumping of the laser transition

View Answer:

Answer: **Option A**

Solution:

43. The first laser emitted

a. Pulses of 694 nm red light

b. A continuous red beam

c. Pulses of white light from a helical flash lamp

d. Spontaneous emission

View Answer:
Answer: **Option A**

Solution:

44. What is the stage of the sand becoming a silicon?

a. Liquid

b. Gas

c. Molten

d. Hot

View Answer:
Answer: **Option C**

Solution:

45. Which of the following is used as an optical transmitter on the Fiber Optical Communications?

a. APD

b. LSA diode

c. PIN diode

d. LED

View Answer:
Answer: **Option D**

Solution:

46. Which of the following is used as an optical receiver in fiber optics communications

a. APD

b. Tunnel diode

c. Laser diode

d. LED

View Answer:
Answer: **Option A**

Solution:

47. The numerical aperture of a fiber if the angle of acceptance is 15 degrees, is

a. 017

b. 0.26

c. 0.50

d. 0.75

View Answer:
Answer: **Option B**

Solution:

48. The inner portion of the fiber cable is called

a. Cladding

b. Coating

c. Inner conductor

d. Core

View Answer:
Answer: **Option D**

Solution:

49. Which type of laser is the simplest to modulate directly by changing its excitation?

a. Semiconductor

b. Ruby

c. Helium-neon

d. Neodymium-YAG

View Answer:
Answer: **Option A**

Solution:

50. The laser frequency when the light has the wavelength 800 nm is

a. 375 x 10^12 Hz

b. 475 x 10^15 Hz

c. 375 x 10^9 Hz

d. 375 x 10^18 Hz

View Answer:
Answer: **Option A**

51. Which of the following is not a common application of fiber-optic cable?

a. Computer networks

b. Long-distance telephone systems

c. Closed circuit TV

d. Consumer TV

View Answer:
Answer: **Option D**

Solution:

52. Total internal reflection takes place if the light ray strikes the interface at an angle with what relationship to the critical angle?

a. Less than

b. Greater than

c. Equal to

d. Zero

View Answer:
Answer: **Option B**

Solution:

53. The operation of the fiber-optic cable is based on the principle of

a. Refraction

b. Reflection

c. Dispersion

d. Absorption

View Answer:
Answer: **Option B**

Solution:

54. Which of the following is not a common type of fiber-optic cable?

a. Single-mode step-index

b. Multimode graded-index

c. Single-mode graded-index

d. Multimode step-index

View Answer:
Answer: **Option C**

Solution:

55. Cable attenuation is usually expressed in terms of

a. Loss per foot

b. dB/km

c. intensity per mile

d. voltage drop per inch

View Answer:
Answer: **Option B**

Solution:

56. Which of the cable length has the highest attenuation?

a. 1 km

b. 2 km

c. 95 ft

d. 5500 ft

View Answer:
Answer: **Option B**

Solution:

57. The upper pulse rate and information carrying capacity of a cable is limited by

a. Pulse shortening

b. Attenuation

c. Light leakage

d. Modal dispersion

View Answer:
Answer: **Option D**

Solution:

58. The core of a fiber optic cable is made of

a. Air

b. Glass

c. Diamond

d. Quartz

View Answer:
Answer: **Option B**

Solution:

59. The core of a fiber optic is surrounded by

a. Wire braid shield

b. Kevlar

c. Cladding

d. Plastic insulation

View Answer:

Answer: **Option C**

Solution:

60. The speed of light in plastic compared to the speed of light in air is

a. Slower

b. Faster

c. The same

d. Either lower or faster

View Answer:
Answer: **Option A**

Solution:

61. Which of the following is not a major benefit of fiber-optic cable?

a. Immunity from interference

b. No electrical safety problems

c. Excellent data security

d. Lower cost

View Answer:
Answer: **Option B**

Solution:

62. The main benefit of light-wave communications over microwaves or any other communications media is

a. Lower cost

b. Better security

c. Wider bandwidth

d. Freedom from interference

View Answer:
Answer: **Option C**

Solution:

63. Which of the following is not part of the optical spectrum?

a. Infrared

b. Ultraviolet

c. Visible color

d. X-rays

View Answer:
Answer: **Option D**

Solution:

64. The wavelength of visible light extends from

a. 0.8 to 1.0 nm

b. 400 to 750 nm

c. 200 to 660 nm

d. 700 to 1200 nm

View Answer:
Answer: **Option B**

Solution:

65. The speed of light is

a. 186,000 mi/h

b. 300 mi/h

c. 300,000 m/s

d. 300,000,000 m/s

View Answer:
Answer: **Option D**

Solution:

66. Refraction is the

a. Bending of light waves

b. Reflection of light waves

c. Distortion of light waves

d. Diffusion of light waves

View Answer:
Answer: **Option A**

Solution:

67. The ratio of speed of light in air to the speed of light in another substance is called the

a. Speed factor

b. Index of reflection

c. Index of refraction

d. Dielectric constant

View Answer:
Answer: **Option C**

Solution:

68. A popular light wavelength in fiber-optic cable is

a. 0.7 μm

b. 1.3 μm

c. 1.5 μm

d. 1.8 μm

View Answer:
Answer: **Option B**

Solution:

69. Which type of fiber optic cable is most widely used?

a. Single-mode step-index

b. Multimode step-index

c. Single-mode graded-index

d. Multimode graded-index

View Answer:
Answer: **Option A**

Solution:

70. Which type of fiber-optic cable is the best for very high speed data?

a. Single-mode step-index

b. Multimode step-index

c. Single-mode graded-index

d. Multimode graded-index

View Answer:
Answer: **Option A**

Solution:

71. Which type of fiber-optic cable has the least modal dispersion?

a. Single mode step-index

b. Multimode step-index

c. Single-mode graded-index

d. Multimode graded-index

View Answer:
Answer: **Option A**

Solution:

72. Which of the following is not a factor in cable light loss?

a. Reflection

b. Absorption

c. Scattering

d. Dispersion

View Answer:
Answer: **Option A**

Solution:

73. A distance of 8 km is the same as

a. 2.5 mi

b. 5 mi

c. 8 mi

d. 12.9 mi

View Answer:
Answer: **Option B**

Solution:

74. A fiber-optic cable has a loss of 15 dB/km. The attenuation in a cable, 100 ft long is

a. 4.57 dB

b. 9.3 dB

c. 24 dB

d. 49.2 dB

View Answer:
Answer: **Option A**

Solution:

75. Fiber-optic cables with attenuations of 1.8, 3.4, 5.9, and 18 dB are linked together. The total loss is

a. 7.5 dB

b. 19.8 dB

c. 29.1 dB

d. 650 dB

View Answer:
Answer: **Option C**

Solution:

76. Which light emitter is preferred for high speed data in a fiber-optic system

a. Incandescent

b. LED

c. Neon

d. Laser

View Answer:
Answer: **Option D**

Solution:

77. Most fiber-optic light sources emit light in which spectrum?

a. Visible

b. Infrared

c. Ultraviolet

d. X-ray

View Answer:
Answer: **Option B**

Solution:

78. Both LEDs and ILDs operate correctly with

a. Forward bias

b. Reverse bias

c. Neither A or B

d. Either A or B

View Answer:
Answer: **Option A**

Solution:

79. Single-frequency light is called

a. Pure

b. Intense

c. Coherent

d. Monochromatic

View Answer:
Answer: **Option D**

Solution:

80. Laser light is very bright because it is

a. Pure

b. White

c. Coherent

d. Monochromatic

View Answer:
Answer: **Option C**

Solution:

81. Which of the following is NOT a common light detector

a. PIN photodiode

b. Photovoltaic diode

c. Photodiode

d. Avalanche photodiode

View Answer:
Answer: **Option B**

Solution:

82. Which of the following is the fastest light sensor

a. PIN photodiode

b. Photovoltaic diode

c. Phototransistor

d. Avalanche photodiode

View Answer:
Answer: **Option D**

Solution:

83. Photodiodes operate property with

a. Forward bias

b. Reverse bias

c. Neither A or B

d. Either A or B

View Answer:
Answer: **Option B**

Solution:

84. The product of the bit rate and distance of a fiber-optic system is 2 Gbits km/s. What is the maximum rate at 5 km?

a. 100 Mbits/s

b. 200 Mbits/s

c. 400 Mbits/s

d. 1000 Gbits/s

View Answer:
Answer: **Option C**

Solution:

85. Which fiber-optic system is better?

a. 3 repeaters

b. 8 repeaters

c. 11 repeaters

d. 20 repeaters

View Answer:
Answer: **Option A**

Solution:

86. An important requirement for successful transmission system using light

a. Powerful, reliable light source

b. Strong glass

c. Reliable, high cost transmission medium

d. Powerful regenerators

View Answer:
Answer: **Option A**

Solution:

87. What is used to block light from a laser and let other light through

a. Neutral density

b. Color

c. Interference

d. Spatial

View Answer:
Answer: **Option C**

Solution:

88. _____ is a light that can be coherent

a. Spontaneous emission

b. Monochromatic and in-phase

c. Narrow beam divergence

d. Monochromatic

View Answer:
Answer: **Option B**

Solution:

89. Coherence of laser light is important for _____

a. Light propagation

b. Getting laser light to pass through air

c. Drilling holes

d. Holography

View Answer:
Answer: **Option D**

Solution:

90. The ultrapure glass used to manufacture optical fibers is approximately ____ pure

a. 99.9 %

b. 99.99 %

c. 99.999 %

d. 99.9999 %

View Answer:
Answer: **Option D**

Solution:

91. In fiber optics, PCS stands for

a. Plastic-clad-silica

b. Polyethylene-clad-silica

c. Personal carrier system

d. Personal communication

View Answer:
Answer: **Option A**

Solution:

92. How many longitudinal modes can fall within a laser's gain bandwidth?

a. 2

b. 5

c. 9

d. No fixed limit, dependent on bandwidth and mode spacing

View Answer:
Answer: **Option D**

Solution:

93. _____ is the result of photons of light that are absorbed by the atoms of the glass core molecules

a. Ion resonance absorption

b. Ultraviolet absorption

c. Infrared absorption

d. Absorption loss

View Answer:
Answer: **Option C**

Solution:

94. In fiber optics, SCS stands for

a. Suppressed-clad-silicon

b. Silicon base-class-silica

c. Silica-clad-silica

d. Serial-clad-silicon

View Answer:
Answer: **Option C**

Solution:

95. Human laser was developed by A. Javen at Bell laboratory in

a. 1960

b. 1962

c. 1963

d. 1964

View Answer:
Answer: **Option A**

Solution:

96. What parameter of light detector determines the range or system length that can be achieved for a given wavelength?

a. Transit time

b. Spectral response

c. Dark current

d. Responsitivity

View Answer:
Answer: **Option B**

Solution:

97. Dark current in light detectors is caused by

a. Thermally generated carriers in the diode

b. The absence of light input

c. Small leakage current

d. Its imperfection

View Answer:
Answer: **Option A**

Solution:

98. What is the unit of responsitivity?

a. Ampere/volt

b. Ampere/watt

c. Watt/ampere

d. Volts/ampere

View Answer:
Answer: **Option B**

Solution:

99. One of the following is not a characteristic of light detectors.

a. Responsitivity

b. Spectral response

c. Transmit time

d. Dispersion

View Answer:
Answer: **Option D**

Solution:

100. What is the typical wavelength of light emitted from epitaxially grown LEDs?

a. 840 nm

b. 490 nm

c. 480 nm

d. 940 nm

View Answer:
Answer: **Option D**

101. SONET stands for

a. System Optical Network

b. Synchronous Optical Network

c. Silica Optic Network

d. System Optical Fiber Net

View Answer:
Answer: **Option B**

Solution:

102. Band loss is

a. A reduction in transmitter power caused by earth's surface curvature

b. A reduction in strength of the signal caused by folded dipole bends

c. An attenuation increase caused by bends radiating from the side of the fiber

d. All of these

View Answer:
Answer: **Option C**

Solution:

103. Infrared range for fiber optics

a. 400 – 700 nm

b. 700 – 1200 nm

c. 300 – 2000 nm

d. 400 – 7000 nm

View Answer:
Answer: **Option B**

1) In an optical fiber communication system, which among the following is not a typical transmitter function?
a. Coding for error protection
b. Decoding of input data
c. Electrical to optical conversion
d. Recoding to match output standard
ANSWER: (d) Recoding to match output standard
2) Which among the following is provided by an optical receiver for the regeneration of data signal with minimum error?
a. Photo-diode
b. Signal Processing Circuits
c. Linear Circuitry
d. None of the above
ANSWER: (c) Linear Circuitry
3) For a sine wave, the frequency is represented by the cycles per _____
a. Second
b. Minute

c. Hour
d. None of the above
ANSWER: (a) Second
4) Which property/ies of PCM stream determine/s the fidelity to original analog signal?
a. Sampling rate
b. Bit depth
c. Both a and b
d. None of the above
ANSWER: (c) Both a and b
5) In single-mode fibers, how does the fraction of energy traveling through bound mode appear in the cladding?
a. As a crescent wave
b. As a gibbous wave
c. As an evanescent wave
d. All of the above
ANSWER: (c) As an evanescent wave
6) What is the typical value of refractive index for an ethyl alcohol?
a. 1
b. 1.36
c. 2.6
d. 3.4
ANSWER:(b) 1.36
7) If a light travels in a certain medium and it gets reflected off an optically denser medium with high refractive index, then it is regarded as _____
a. External Reflection
b. Internal Reflection
c. Both a and b
d. None of the above
ANSWER: (a) External Reflection
8) In an optical fiber, the concept of Numerical aperture is applicable in describing the ability of _____
a. Light Collection
b. Light Scattering
c. Light Dispersion
d. Light Polarization
ANSWER:(a) Light Collection

9) Which among the following do/does not support/s the soot formation process?
a. OVPO
b. MCVD
c. PCVD
d. All of the above
ANSWER: (c) PCVD
10) Which type of photonic crystal fiber exhibit/s its/their similarity to the periodic crystalline lattice in a semiconductor?
a. Index guiding fiber
b. Photonic bandgap fiber
c. Both a and b
d. None of the above
ANSWER: (b) Photonic bandgap fiber
11) Which type of fiber optic cable has/have its/their core with the size of about 480 µm to 980 µm & made up of polymethylmethacrylate (PMMA)?
a. Glass fiber optic cable
b. Plastic fiber optic cable
c. Plastic clad silica fiber optic cable
d. All of the above
ANSWER: (b) Plastic fiber optic cable
12) In multifiber cable system, which form of outer jacket/s consist/s of polyolefin compounds and are regarded as halogen free?
a. OFNR
b. OFNP
c. LSZH
d. All of the above
ANSWER: (c) LSZH
13) During the design of FOC system, which among the following reasons is/are responsible for an extrinsic absorption?
a. Atomic defects in the composition of glass
b. Impurity atoms in glass material
c. Basic constituent atoms of fiber material
d. All of the above
ANSWER: (b) Impurity atoms in glass material
14) Which among the following represent/s the measure/s to minimize the inhomogenities for Mie scattering reduction?

a. Extrusion Control
b. Increase in relative R.I. difference
c. Removal of imperfections due to glass manufacturing process
d. All of the above
ANSWER: (d) All of the above

15) In Kerr effect, induced index change has its proportionality with respect to _____
a. square of electric field
b. cube of electric field
c. cube root of electric field
d. one-fourth power of electric field
ANSWER: (a) square of electric field

16) Which among the following is regarded as an inelastic scattering of a photon?
a. Kerr Effect
b. Raman Effect
c. Hall Effect
d. Miller Effect
ANSWER: (b) Raman Effect

17) Which kind/s of misalignment assist/s in the reduction of overlap region in fiber?
a. Angular
b. Longitudinal
c. Lateral
d. All of the above
ANSWER: (c) Lateral

18) Which is the correct order of sequential steps for an electric arc fusion technique?
A. Pressing of fiber ends for fusion
B. Application of heat for smoothening of end-surfaces
C. Alignment of broken fiber edges

a. A, B, C
b. B, A, C
c. C, B, A
d. C, A, B
ANSWER: (c) C, B, A

19) Which splicing technique involves the alignment and locking of broken fiber edges by means of positioning devices & optical cement?

a. Fusion

b. Mechanical

c. Both a and b

d. None of the above

ANSWER:(b) Mechanical

20) By using Springroove splicing technique, what is the value of mean insertion loss for multi mode graded index fiber?

a. 0.01

b. 0.03

c. 0.05

d. 0.09

ANSWER: (c) 0.05

21) In the fiber optic link, power transfer from one fiber to another and from fiber to detector must take place with _____coupling efficiency.

a. maximum

b. stable

c. minimum

d. unpredictable

ANSWER: (a) maximum

22) In spontaneous emission, the light source in an excited state undergoes the transition to a state with _____

a. Higher energy

b. Moderate energy

c. Lower energy

d. All of the above

ANSWER: (c) Lower energy

23) 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 the above

ANSWER: (b) Stimulated Emission

24) While coupling of LEDs with fiber, on which factor/s does the size of source and lighting angle generated within the semiconductor depend/s?

a. Geometry of die
b. Refractive index of semiconductor
c. Encapsulation Medium
d. All of the above
ANSWER: (d) All of the above

25) Which among the following results in the removal of LED lens interface for achieving high coupling efficiency?
a. Spherical lens
b. Cylindrical lens
c. Integral lens LED
d. All of the above
ANSWER: (c) Integral lens LED

26) For a photo-diode with responsivity of 0.50 A/W & optical power of about 12µW, what would be the value of generated photocurrent?
a. 3 µA
b. 6 µA
c. 9 µA
d. 12 µA
ANSWER: (b) 6 µA

27) Which component of an optical receiver is a linear frequency shaping filter used for the compensation of signal distortion and Inter Symbol Interference (ISI)?
a. Photodetector
b. Amplifier
c. Equalizer
d. None of the above
ANSWER: (c) Equalizer

28) In digital receivers, which codes are used to designate the sampled analog signals after their quantization into discrete levels?
a. Binary
b. Decimal
c. ASCII
d. Excess-3
ANSWER: (a) Binary

29) Which feature of an eye-diagram assists in the measurement of additive noise in the signal?
a. Eye opening (height, peak to peak)
b. Eye overshoot/ undershoot

c. Eye width
d. None of the above
ANSWER: (a) Eye opening (height, peak to peak)
30) Which method determines the dispersion limitation of an optical link?
a. Link power budget
b. Rise time budget
c. Both a and b
d. None of the above
ANSWER: (b) Rise time budget
31) Which phenomenon causes the dynamic line width broadening under the direct modulation of injection current?
a. Modal Noise
b. Mode-partition Noise
c. Frequency Chirping
d. Reflection Noise
ANSWER: (c) Frequency Chirping
32) Speckle pattern is generated due to interference of nodes from a coherent source especially when the coherence time of source is _____ the intermodal dispersion time in the fiber.
a. Less than
b. Greater than
c. Equal to
d. None of the above
ANSWER: (b) Greater than
33) Which among the following is/are determined by the fiber characterization?
a. Fiber integrity & performance for desired transmission rate
b. Installation practices
c. Service Implementation
d. All of the above
ANSWER: (d) All of the above
34) From the tests carried out in fiber characterization, which among the following measures the total light reflected back to the transmitter caused by the fiber as well as the components like connector pairs and mechanical splices?
a. ORL
b. OTDR

c. LTS
d. PMD
ANSWER: (a) ORL
35) In fiber fault location, the equation of length (l) for time difference (t) is expressed as $L = ct / 2n_1$. Which factor in this equation implies that the light travels a length from source to break point and then through another length on the return trip?
a. L
b. c
c. t
d. 2
ANSWER: (d) 2
36) Which line code in PCM indicates the return of signal to zero between each pulse & takes place even due to occurrence of consecutive 0's & 1's in the signal?
a. Return-to-zero (RZ)
b. Non-Return to zero space
c. Return to zero inverted
d. Non-return to zero inverted
ANSWER: (a) Return-to-zero (RZ)
37) In the structure of fiber, the light is guided through the core due to total internal _____
a. reflection
b. refraction
c. diffraction
d. dispersion
ANSWER: (a) reflection
38) In the structure of a fiber, which component provides additional strength and prevents the fiber from any damage?
a. Core
b. Cladding
c. Buffer Coating
d. None of the above
ANSWER: (c) Buffer Coating
39) Which is the transmission medium for VLF electromagnetic waves especially applicable for aeronautical and submarine cables?
a. Paired wires
b. Coaxial cable

c. Waveguide
d. Wireless
ANSWER: (a) Paired wires
40) Which rays exhibit the variation in the light acceptability ability of the fiber?
a. Meridional
b. Skew
c. Leaky
d. All of the above
ANSWER: (b) Skew
41) If a fiber operates at 1400nm with the diameter of about 10 μm, n_1 = 1.30, Δ = 0.80% , V = 3.5, then how many modes will it have?
a. 6.125
b. 9.655
c. 12.95
d. 16.55
ANSWER: (a) 6.125
42) Which kind of dispersion phenomenon gives rise to pulse spreading in single mode fibers?
a. Intramodal
b. Intermodal
c. Material
d. Group Velocity
ANSWER: (a) Intramodal
43) With respect to single mode and graded index fibers, which parameter specifies the propagation of polarization modes with different phase velocities & the difference between their effective refractive indices?
a. Mode field diameter
b. Birefringence
c. Fiber beat length
d. Spot Size
ANSWER: (b) Birefringence
44) On which of the following factor/s do/does the 'Hydrogen Effect' depend/s?
a. Type of fiber & Cable Design
b. Operating Wavelength
c. Installation Method
d. All of the above

ANSWER: (d) All of the above

45) Consider the statements given below. Which among them is not a drawback of double crucible method?

a. Utility in mass production of fibers
b. High attenuation
c. High OH content in drawn fiber
d. Addition of impurity while the fiber is drawn

ANSWER: (a) Utility in mass production of fibers

46) 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

a. B, D, A, C
b. A, B, C, D
c. C, A, D, B
d. D, B, A, C

ANSWER: (a) B, D, A, C

47) At which level of temperature does the oxidation process occur in MCVD?

a. Low
b. Moderate
c. High
d. Unpredictable

ANSWER: (c) High

48) Assuming no ISI, the maximum possible bandwidth of a multimode graded index fiber with 5 MHz, shows the total pulse broadening of 0.1s for the distance of about 12km. What would be the value of bandwidth length product?

a. 40 MHz
b. 60 MHz
c. 90 MHz
d. 120 MHz

ANSWER: (b) 60 MHz

49) In Rayleigh scattering of light in glass, at which type of temperature does the glass attain the state of thermal equilibrium and exhibits its relativity to annealing temperature?

a. Junction
b. Fictive
c. Breakdown
d. Decomposition

ANSWER: (b) Fictive

50) Which type of scattering occurs due to interaction of light in a medium with time dependent optical density variations thereby resulting into the change of energy (frequency) & path?

a. Stimulated Brilliouin Scattering (SBS)
b. Stimulated Raman Scattering (SRS)
c. Mie Scattering
d. Rayleigh Scattering

ANSWER: (a) Stimulated Brilliouin Scattering (SBS)

2020 Founded the wave theory of light

A. Francesco Grimaldi

B. Edward Appleton

C. James Clerk Maxwell

D. Christian Huygens

ANSWER: D

2020 The band of light wavelengths those are too long to be seen by the human eye

A. Amber

B. Visible

C. Infrared

D. Ultraviolet

ANSWER: C

2020 Which color has the shortest wavelength of light?

A. Red

B. Yellow

C. Blue

D. Green

ANSWER: C

2020 Which of the following materials is sensitive to light?

A. Photoresist

B. Photosensitive

C. Light Sensitive

D. Maser

ANSWER: A

2020 The core of an optical fiber has a

A. Lower refracted index than air

B. Lower refractive index than the cladding

C. Higher refractive index than the cladding

D. Similar refractive index with the cladding

ANSWER: C

2020 The loss in signal power as light travels down a fiber is called

A. Dispersion

B. Scattering

C. Absorption

D. Attenuation

ANSWER: D

2020 The bandwidth of optical fiber

A. 900M Hz

B. 900 PHz

C. 900 THz

D. 900 EHz

ANSWER: C

2020 Which theory states that the light wave behaves as if it consists of many tiny particles?

A. Huygen's theory

B. Wave theory of light

C. Nyquist theory

D. Quantum theory

ANSWER: D

2020 When a beam of light enters one medium from another, which quantity will not change?

A. Direction

B. Speed

C. Frequency

D. Wavelength

ANSWER: C

2020 Dispersion is used to describe the

A. Splitting of white light into its component colors

B. Propagation of light in straight lines

C. Bending of a beam of light when it goes from one medium to another

D. Bending of a beam light when it strikes a mirror

ANSWER: A

2020 Luminance efficiency is minimum for a

A. Fluorescent tube

B. High wattage light bulb

C. Mercury vapor lamp

D. Low wattage light bulb

ANSWER: D

2020 _____ dispersion is caused by the difference in the propagation times of light rays that take different paths down a fiber.

A. Material dispersion

B. Wavelength dispersion

C. Modal dispersion

D. Delay dispersion

ANSWER: C

2020 What is the average insertion loss of fusion splice in fiber optics?

A. 0.09 dB

B. 0.9 dB

C. 0.19 dB

D. 0.009 dB

ANSWER: A

2020 What is the lifetime of LEDs?

A. 200,000 minutes

B. 200,000 hours

C. 150,000 minutes

D. 150,000 hours

ANSWER: B

What is the lifetime of ILDs?

A. 50,000 hours

B. 75,000 hours

C. 100,000 hours

D. 125,000 hours

ANSWER: A

2020 Photodiodes used as fiber optic directors are

A. Unbiased to generate a voltage same as a solar cell

B. Forward bias

C. Reversed bias

D. Thermoelectrically cooled

ANSWER: C

2020 What type of fiber has the highest modal dispersion?

A. Step-index multimode

B. Graded index multimode

C. Step-index single mode

D. Graded index mode

ANSWER: A

2020 Laser light is _____ emission.

A. Coherent

B. Stimulated

C. Spontaneous

D. Coherent and stimulated

ANSWER: D

2020 Is a non-coherent light source foe optical communications system.

A. ILD

B. LED

C. APD

D. PIN Diode

ANSWER: B

2020 Which type of laser is the simplest to modulate directly by changing its excitation?

A. Semiconductor

B. Ruby

C. Helium-neon

D. Neodymium-YAG

ANSWER: A

2020 Which of the following is used as an optical transmitter on the Fiber Optical Communications?

A. APD

B. LSA diode

C. PIN diode

D. LED

ANSWER: D

2020 Which of the following is used as an optical receiver in fiber optics communications

A. APD

B. Tunnel diode

C. Laser diode

D. LED

ANSWER: A

2020 The numerical aperture of a fiber if the angle of acceptance is 15 degrees, is

A. 017

B. 0.26

C. 0.50

D. 0.75

ANSWER: B

2020 The inner portion of the fiber cable is called

A. Cladding

B. Coating

C. Inner conductor

D. Core

ANSWER: D

2020 Total internal reflection takes place if the light ray strikes the interface at an angle with what relationship to the critical angle?

A. Less than

B. Greater than

C. Equal to

D. Zero

ANSWER: B

2020 The main benefit of light-wave communications over microwaves or any other communications media is

A. Lower cost

B. Better security

C. Wider bandwidth

D. Freedom from interference

ANSWER: C

2020 Which type of fiber-optic cable has the least modal dispersion?

A. Single mode step-index

B. Multimode step-index

C. Single-mode graded-index

D. Multimode graded-index

ANSWER: A

2020 Fiber-optic cables with attenuations of 1.8, 3.4, 5.9, and 18 dB are linked together. The total loss is

A. 7.5 dB

B. 19.8 dB

C. 29.1 dB

D. 650 dB

ANSWER: C

2020 Which light emitter is preferred for high speed data in a fiber-optic system

A. Incandescent

B. LED

C. Neon

D. Laser

ANSWER: D

2020 Most fiber-optic light sources emit light in which spectrum?

A. Visible

B. Infrared

C. Ultraviolet

D. X-ray

ANSWER: B

2020 Both LEDs and ILDs operate correctly with

A. Forward bias

B. Reverse bias

C. Neither A or B

D. Either A or B

ANSWER: A

2020 Single-frequency light is called

A. Pure

B. Intense

C. Coherent

D. Monochromatic

ANSWER: D

2020 Laser light is very bright because it is

A. Pure

B. White

C. Coherent

D. Monochromatic

ANSWER: C

2020 Which of the following is NOT a common light detector

A. PIN photodiode

B. Photovoltaic diode

C. Photodiode

D. Avalanche photodiode

ANSWER: B

2020 Which of the following is the fastest light sensor

A. PIN photodiode

B. Photovoltaic diode

C. Phototransistor

D. Avalanche photodiode

ANSWER: D

2020 An important requirement for successful transmission system using light

A. Powerful, reliable light source

B. Strong glass

C. Reliable, high cost transmission medium

D. Powerful regenerators

ANSWER: A

2020 Material dispersion is caused by the

A. Wavelength dependence of the index of refraction

B. Wavelength independence of the index of refraction

C. Dependence of the propagation constant on the mode number

D. Independence of the propagation constant on the mode number

ANSWER: A

2020 Modal dispersion is caused by the

A. Dependence of wavelength on index of refraction

B. Dependence of propagation constant on index of refraction

C. Dependence of the propagation constant on the wavelength

D. Dependence of the propagation constant on the mode number

ANSWER: D

2020 The dominant loss mechanisms in silica fiber are

A. Absorption and radiation losses

B. Absorption and Rayleigh scattering

C. Coupling and radiation losses

D. Radiation and modal dispersion

ANSWER: B

2020 How much is the power loss of the fusion splice?

A. 0.1 dB or less

B. 0.01 dB or less

C. 1 dB or less

D. 10 dB or less

ANSWER: B

2020 Used to test a fiber optics splice

A. Spectrum analyzer

B. Oscilloscope

C. Optical power meter

D. Field strength meter

ANSWER: C

2020 Which modulation methods are the most widely used in optical systems?

A. Phase and frequency modulations

B. Polarization modulation and phase modulation

C. Intensity modulation and phase modulation

D. Intensity modulation and polarization modulation

ANSWER: D

2020 Which type of fiber optic cable is best for very high speed data?

A. single-mode step-index

B. multimode step-index

C. single-mode graded-index

D. multimode graded-index

ANSWER: A

2020 A measure of conversion efficiency of a photodetector.

A. Efficiency

B. Responsivity

C. Dark current

D. Spectral response

ANSWER: B

2020 The leakage current that flows through a photodiode with no light input

A. dark voltage

B. dark impedance

C. dark power

D. dark current

ANSWER: D

2020 The time it takes a light induced carrier travel across the depletion region of the semiconductor.

A. dispersion

B. response time

C. irradiance

D. transit time

ANSWER: D

2020 The range of wavelength values that a given photodiode will responD.

A. spectral response

B. permeance

C. dark current

D. reluctance

ANSWER: A

2020 The term responsivity as it applies to a light detector is best described as

A. the time required for the signal to go from 10 to 90 percent of maximum amplitude

B. the ratio of the diode output current to the input optical power

C. the ratio of the input power to output power

D. the ratio of output current to input current

ANSWER: B

2020 The minimum optical power a light detector can receive and still produce a usable electrical output signal.

A. light responsivity

B. light sensitivity

C. light collectivity

D. illumination

ANSWER: B

2020 Type of lasers that uses a mixture of helium and neon enclosed in glass tube.

A. gas lasers

B. solid lasers

C. semiconductor lasers

D. liquid lasers

ANSWER: A