Matoshri College of Engineering & Research Centre , Nashik

Department of Electronics & Telecommunication Engineering

Class: B. E. E & TC **Sub: BCS**

A.Y.2019-2020 **Semester -II**

Sr.No.	Question	A	B	C	D	Correct
1	Who proposed the idea of transmission of light via dielectric waveguide structure?	a) Christian Huygens	b) Karpon and Bockham	c) Hondros and debye	d) Albert Einstein	: c
2	Who proposed the use of clad waveguide structure?	a) Edward Appleton	b) Schriever	c) Kao and Hockham	d) James Maxwell	: c
3	Which law gives the relationship between refractive index of the dielectric?	a) Law of reflection	b) Law of refraction (Snell's Law).	c) Millman's Law	d) Huygen's Law	: b
4	The light sources used in fibre optics communication are :	a) LED's and Lasers	b) Phototransistors	c) Xenon lights	d) Incandescent	: a
5	The _____ ray passes through the axis of the fiber core.	a) Reflected	b) Refracted	c) Meridional	d) Shew	: c
6	Light incident on fibers of angles_____the acceptance angle do not propagate into the fiber	a) Less than	b) Greater than	c) Equal to	d) Less than and equal to	: b
7	What is the numerical aperture of the fiber if the angle of acceptance is 16 degree	a) 0.50	b) 0.36	c) 0.20	d) 0.27	: d
8	The ratio of speed of light in air to the speed of light in another medium is called as_____	a) Speed factor	b) Dielectric constant	c) Reflection index	d) Refraction index	: d
9	When a ray of light enters one medium from another medium, which quality will not change	a) Direction	b) Frequency	c) Speed	d) Wavelength	: b
10	An optical fiber has core-index of 1.480 and a cladding index of 1.478. What should be the core size for single mode operation at 1310nm?	a) 7.31μm	b) 8.71μm	c) 5.26μm	d) 6.50μm	: d
11	An optical fiber has a core radius 2μmand a numerical aperture of 0.1. Will this fiber operate at single mode at 600 nm?	a) Yes	b) No			: a
12	What is needed to predict the performance characteristicsics of single mode fibers?	a) The intermodal delay effect	b) Geometric distribution of light in a propagating mode	c) Fractional power flow in the cladding of fiber	d) Normalized frequency	: b
13	Which equation is used to calculate MFD?	a) Maxwell's equations	b) Peterman equations	c) Allen Cahn equations	d) Boltzmann's equations	: b

14	A single mode fiber has mode field diameter 10.2μmand V=2.20. What is the core diameter of this fiber?	a) 11.1μm	b) 13.2μm	c) 7.6μm	d) 10.1μm	: d
15	The difference between the modes' refractive indices is called as	a) Polarization	b) Cutoff	c) Fiber birefringence	d) Fiber splicing	: c
16	A single mode fiber has a beat length of 4cm at 1200nm. What is birefringence?	a) $2*10^{-5}$	b) $1.2*10^{-5}$	c) $3*10^{-5}$	d) 2	: c
17	How many propagation modes are present in single mode fibers?	a) One	b) Two	c) Three	d) Five	: b
18	Numerical aperture is constant in case of step index fiber. State whether the statement is true or false.	a) True	b) False			: a
19	Plastic fibers are less widely used than glass fibers. State whether the statement is true or false.	a) True	b) False			: a
20	Which equations are best suited for the study of electromagnetic wave propagation?	a) Maxwell's equations	b) Allen-Cahn equations	c) Avrami equations	d) Boltzmann's equations	: a
21	When λ is optical wavelength in vacuum, k is given by k=2Π/λ. What does k stand for in the above equation?	a) Phase propagation constant	b) Dielectric constant	c) Boltzmann's constant	d) Free-space constant	: a
22	Constructive interference occurs when total phase change after two successive reflections at upper and lower interfaces is equal to? (Where m is integer)	a) 2Πm	b) Πm	c) Πm/4	d) Πm/6	: a
23	. When light is described as an electromagnetic wave, it consists of a periodically varying electric E and magnetic field H which are oriented at an angle	a) 90 degree to each other	b) Less than 90 degree	c) Greater than 90 degree	d) 180 degree apart	: a
24	A monochromatic wave propagates along a waveguide in z direction. These points of constant phase travel in constant phase travel at a phase velocity V_p is given by	a) $V_p=\omega/\beta$	b) $V_p=\omega/c$	c) $V_p=C/N$	d) V_p=mass/acceleration	: a
25	A most important velocity in the study of transmission characteristics of optical fiber is	a) Phase velocity	b) Group velocity	c) Normalized velocity	d) Average velocity	: b
26	Refraction is the	a) Bending of light waves	b) Reflection of light waves	c) Diffusion of light waves	d) Refraction of light waves	: a
27	The phenomenon which occurs when an incident wave strikes an interface at an angle greater than the critical angle with respect to the normal to the surface is called as	a) Refraction	b) Partial internal reflection	c) Total internal reflection	d) Limiting case of refraction	: c
28	Photonic crystal fibers also called as	a) Conventional fibers	b) Dotted fibers	c) Stripped fibers	d) Holey fibers	: d

29	Conventional optical fibers has more transmission losses than photonic crystal fibers. State whether the statement is true or false.	a) True	b) False			: a
30	Losses in photonic crystal fibers are reduced to a level of	a) 0.1dB/km	b) 0.2dB/km	c) 0.3dB/km	d) 0.4dB/km	: c
31	The high index contrast enables the PCF core to be reduced from around 8 μmin conventional fiber to	a) Less than 1μm	b) More than 5μm	c) More than 3μm	d) More than 2μm	: a
32	The periodic arrangement of cladding air holes in photonic band gap fibers provides for the formation of a photonic band gap in the	a) H-plane of fiber	b) E-plane of fiber	c) E-H-plane of fiber	d) Transverse plane of fiber	: d
33	In index-guided photonic crystal fiber structure, the dark areas are air holes. What does white areas suggests?	a) Air	b) Silica	c) Water	d) Plasma	d
34	The unit of measurement of attenuation in optical fibers is	a) km	b) dB	c) dB/km	d) Coulomb's	: c
35	The optical fiber incurs a loss in signal power as light travels down the fiber which is called as	a) Scattering	b) Attenuation	c) Absorption	d) Refraction	: b
36	If the input power 100μW is launched into 6 km of fiber, the mean optical power at the fiber output is 2μW. What is the overall signal attenuation through the fiber assuming there are no connectors or splices?	a) 15.23dB	b) 16.98dB	c) 17.12dB	d) 16.62dB	: b
37	A device which reduces the intensity of light in optical fiber communications is	a) compressor	b) Optical attenuator	c) Barometer	d) Reducer	: b
38	. A decibel may be defined as the ratio of input and output optical power for a particular optical wavelength. State whether the following statement is true or false.	a) True	b) False			: a
39	. When the input and output power in an optical fiber is 120μW & 3μW respectively and the length of the fiber is 8 km. What is the signal attenuation per km for the fiber?	a) 3dB/km	b) 2dB/km	c) 1dB/km	d) 4dB/km	: b
40	A multimode step index fiber has a normalized frequency of 72. Estimate the number of guided modes.	a) 2846	b) 2592	c) 2432	d) 2136	: b
41	A graded-index fiber has a core with parabolic refractive index profile of diameter of 30μm, NA=0.2, λ=1μm. Estimate the normalised frequency.	a) 19.32	b) 18.84	c) 16.28	d) 17.12	: b
42	A step-index fiber has core refractive index 1.46 and radius 4.5μm. Find the cutoff wavelength to exhibit single mode operation. Use relative index difference as 0.25%.	a) 1.326μm	b) 0.124μm	c) 1.214μm	d) 0.123μm	: c

43	A single-mode step-index fiber or multimode step-index fiber allows propagation of only one transverse electromagnetic wave.	a) True	b) False			: True
44	One of the given statements is true for intermodal dispersion. Choose the right one.	a) Low in single mode and considerable in multimode fiber	b) Low in both single mode and multimode fiber	c) High in both single mode and multimode fiber	d) High in single mode and low in multimode fiber	: a
45	For lower bandwidth applications,	a) Single mode fiber is advantageous	b) Photonic crystal fibers are advantageous	c) Coaxial cables are advantageous	d) Multimode fiber is advantageous	: d
46	Most of the optical power is carried out in core region than in cladding. State true or false:	a) True	b) False			: a
47	Meridional rays in graded index fibers follow	a) Straight path along the axis	b) Curved path along the axis	c) Path where rays changes angles at core-cladding interface	d) Helical path	: b
48	What is the unit of normalized frequency?	a) Hertz	b) Meter/sec	c) Coulombs	d) It is a dimensionless quantity	: d
49	. Skew rays follow a	a) Hyperbolic path along the axis	b) Parabolic path along the axis	c) Helical path	d) Path where rays changes angles at core-cladding interface	: c
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59	Skew rays follow a	a) Hyperbolic path along the axis	b) Parabolic path along the axis	c) Helical path	d) Path where rays changes angles at core-cladding interface	: c
60	Which of the following statements best explain the concept of material absorption?	a) A loss mechanism related to the material composition and fabrication of fiber.	b) A transmission loss for optical fibers.	c) Results in attenuation of transmitted light.	d) Causes of transfer of optical power	: a

61	How many mechanisms are there which causes absorption?	a) One	b) Three	c) Two	d) Four	: b
62	Absorption losses due to atomic defects mainly include-	a) Radiation	b) Missing molecules, oxygen defects in glass	c) Impurities in fiber material	d) Interaction with other components of core	: b
63	The effects of intrinsic absorption can be minimized by-	a) Ionization	b) Radiation	c) Suitable choice of core and cladding components	d) Melting	:c
64	Which of the following is not a metallic impurity found in glass in extrinsic absorption?	a) Fe^{2+}	b) Fe^{3+}	c) Cu	d) Si	: d
65	Optical fibers suffer radiation losses at bends or curves on their paths. State true or false	a) True	b) False			: a
66	In the given equation, state what αr suggests;	a) Radius of curvature	b) Refractive index difference	c) Radiation attenuation coefficients	d) Constant of proportionality	: c
67	A multimode fiber has refractive indices n1= 1.15, n2=1.11 and an operating wavelength of 0.7μm. Find the radius of curvature?	a) 8.60μm	b) 9.30μm	c) 9.1μm	d) 10.2μm	: b
68	A single mode fiber has refractive indices n1=1.50, n2= 2.23, core diameter of 8μm, wavelength=1.5μm cutoff wavelength= 1.214μm. Find the radius of curvature?	a) 12 mm	b) 20 mm	c) 34 mm	d) 36 mm	: c
69	How the potential macro bending losses can be reduced in case of multimode fiber?	a) By designing fibers with large relative refractive index differences	b) By maintaining direction of propagation	c) By reducing the bend	a) By operating at larger wavelengths	: a
70	Sharp bends or micro bends causes significant losses in fiber. State true or false	a) True	b) False			: a
71	A multimode step index fiber has source of RMS spectral width of 60nm and dispersion parameter for fiber is 150psnm^{-1}km^{-1}. Estimate rms pulse broadening due to material dispersion.	a) 12.5ns km^{-1}	b) 9.6ns km^{-1}	c) 9.0ns km^{-1}	d) 10.2ns km^{-1}	: c
72	. A multimode fiber has RMS pulse broadening per km of 12ns/km and 28ns/km due to material dispersion and intermodal dispersion resp. Find the total RMS pulse broadening.	a) 30.46ns/km	b) 31.23ns/km	c) 28.12ns/km	d) 26.10ns/km	: a
73	Γ_g= dβ / C*dk. What is β in the given equation?	a) Attenuation constant	b) Propagation constant	c) Boltzmann's constant	d) Free-space	: b
74	Most of the power in an optical fiber is transmitted in fiber cladding. State whether the given statement is true or false.	a) True	b) False	: b		

75	A single mode fiber has a zero dispersion wavelength of 1.21μm and a dispersion slope of 0.08 $psnm^{-2}km^{-1}$. What is the total first order dispersion at wavelength 1.26μm.	a) $-2.8psnm^{-1}\ km^{-1}$	b) $-3.76psnm^{-1}\ km^{-1}$	c) $-1.2psnm^{-1}\ km^{-1}$	d) $2.4psnm^{-1}\ km^{-1}$	: b
76	The dispersion due to material, waveguide and profile are $-2.8nm^{-1}km^{-1}$, $20.1nm^{-1}km^{-1}$ and $23.2nm^{-1}km^{-1}$respectively. Find the total first order dispersion?	a) $36.2psnm^{-1}\ km^{-1}$	b) $38.12psnm^{-1}\ km^{-1}$	c) $40.5psnm^{-1}\ km^{-1}$	d) $20.9psnm^{-1}\ km^{-1}$	: c
77	Dispersion-shifted single mode fibers are created by	a) Increasing fiber core diameter and decreasing fractional index difference	b) Decreasing fiber core diameter and decreasing fractional index difference	c) Decreasing fiber core diameter and increasing fractional index difference	d) Increasing fiber core diameter and increasing fractional index difference	: c
78	An alternative modification of the dispersion characteristics of single mode fibers involves achievement of low dispersion gap over the low-loss wavelength region between –	a) 0.2 and 0.9μm	b) 0.1 and 0.2μm	c) 1.3 and 1.6μm	d) 2 and 3μm	: c
79	The fibers which relax the spectral requirements for optical sources and allow flexible wavelength division multiplying are known as-	a) Dispersion-flattened single mode fiber	b) Dispersion-enhanced single mode fiber	c) Dispersion-compressed single mode fiber	d) Dispersion-standardized single mode fiber	: a
80	For suitable power confinement of fundamental mode, the normalized frequency v should be maintained in the range 1.5 to 2.4μm and the fractional index difference must be linearly increased as a square function while the core diameter is linearly reduced to keep v constant. This confinement is achieved by-	a) Increasing level of silica doping in fiber core	b) Increasing level of germanium doping in fiber core	c) Decreasing level of silica germanium in fiber core	d) Decreasing level of silica doping in fiber core	: b
81	Any amount of stress occurring at the core-cladding interface would be reduced by grading the material composition. State whether the given statement is true or false.	a) True	b) False			: a
82	The variant of non-zero-dispersion-shifted fiber is called as	a) Dispersion flattened fiber	b) Zero-dispersion fiber	c) Positive-dispersion fiber	d) Negative-dispersion fiber	: d
83	Rayleigh scattering and Mie scattering are the types of	a) Linear scattering losses	b) Non-linear scattering losses	c) Fiber bends losses	d) Splicing losses	: a
84	Dominant intrinsic loss mechanism in low absorption window between ultraviolet and infrared absorption tails is	a) Mie scattering	b) Rayleigh scattering	c) Stimulated Raman scattering	d) Stimulated Brillouin scattering	: b
85	Rayleigh scattering can be reduced by operating at smallest possible wavelengths. State whether the following statement is true or false.	a) True	b) False			: b
86	The scattering resulting from fiber imperfections like core-cladding RI differences, diameter fluctuations, strains, and bubbles is	a) Rayleigh scattering	b) Mie scattering	c) Stimulated Brillouin scattering	d) Stimulated Raman scattering	: b
87	Mie scattering has in-homogeneities mainly in	a) Forward direction	b) Backward direction	c) All direction	d) Core-cladding interface	: a
88	The in-homogeneities in Mie scattering can be reduced by coating of a fiber. State whether the following statement is true or false.	a) True	b) False			: a

89	Raman and Brillouin scattering are usually observed at	a) Low optical power densities	b) Medium optical power densities	c) High optical power densities	d) Threshold power densities	: c
90	The phonon is a quantum of an elastic wave in a crystal lattice. State whether the given statement is true or false.	a) True	b) False			: a
91	A single-mode optical fiber has an attenuation of 0.3dB/km when operating at wavelength of 1.1μm. The fiber core diameter is 4μmand bandwidth is 500 MHz. Find threshold optical power for stimulated Brillouin scattering.	a) 11.20 mw	b) 12.77 mw	c) 13.08 mw	d) 12.12 mw	: b
92	0.4 dB/km, 1.4μm, 6μm, 550MHz. Find threshold optical power for stimulated Raman scattering.	a) 1.98 W	b) 1.20 W	c) 1.18 W	d) 0.96 W	: c
93	Stimulated Brillouin scattering is mainly a	a) Forward process	b) Backward process	c) Upward process	d) Downward process	: b
94	High frequency optical phonon is generated in stimulated Raman scattering. State true or false	a) False	b) True			: b
95	For many applications which involve optical fiber transmission, an intensity modulation optical source is not required. State whether the given statement is true or false.	a) True	b) False			: b
96	The optical source used for detection of optical signal is	a) IR sensors	b) Photodiodes	c) Zener diodes	d) Transistors	: b
97	An optical fiber behaves as a birefringence medium due to differences in	a) Effective R-I and core geometry	b) Core-cladding symmetry	c) Transmission/propagation time of waves	d) Refractive indices of glass and silica	: a
98	The beat length in a single mode optical fiber is 8 cm, when light from a laser with a peak wavelength 0.6μm is launched into it. Estimate the modal birefringence.	a) 1×10^{-5}	b) 3.5×10^{-5}	c) 2×10^{-5}	d) 4×10^{-5}	: a
99	Beat length of a single mode optical fiber is 0.6cm. Calculate the difference between propagation constants for the orthogonal modes	a) 69.8	b) 99.86	c) 73.2	d) 104.66	: d
100	A polarization maintaining fiber operates at a wavelength 1.2μm and have a modal birefringence of $1.8*10^{-3}$. Calculate the period of perturbation.	a) 0.7 seconds	b) 0.6 seconds	c) 0.23 seconds	d) 0.5 seconds	: b
101	When two components are equally excited at the fiber input, then for polarization maintaining fibers $\delta\Gamma_g$should be around	a) 1.5ns/km	b) 1 ns/km	c) 1.2ns/km	d) 2ns/km	: b
102	Polarization modal noise can _____ the performance of communication system.	a) Degrade	b) Improve	c) Reduce	d) Attenuate	: a
103	What is dispersion in optical fiber communication?	a) Compression of light pulses	b) Broadening of transmitted light pulses along the channel	c) Overlapping of light pulses on compression	d) Absorption of light pulses	: b

104	What does ISI stands for in optical fiber communication?	a) Invisible size interference	b) Infrared size interference	c) Inter-symbol interference	d) Inter-shape interference	: c
105	For no overlapping of light pulses down on an optical fiber link, the digital bit rate BT must be:	a) Less than the reciprocal of broadened pulse duration	b) More than the reciprocal of broadened pulse duration	c) Same as that of than the reciprocal of broadened pulse duration	d) Negligible	: a
106	The maximum bit rate that may be obtained on an optical fiber link is 1/3Γ. State whether the given statement is true or false.	a) True	b) False			: b
107	3dB optical bandwidth is always _____ the 3dB electrical bandwidth.	a) Smaller than	b) Larger than	c) Negligible than	d) Equal to	: b
108	A multimode graded index fiber exhibits a total pulse broadening of 0.15μsover a distance of 16 km. Estimate the maximum possible bandwidth, assuming no intersymbol interference.	a) 4.6 MHz	b) 3.9 MHz	c) 3.3 MHz	d) 4.2 MHz	: c
109	What is pulse dispersion per unit length if for a graded index fiber, 0.1μs pulse broadening is seen over a distance of 13 km?	a) 6.12ns/km	b) 7.69ns/km	c) 10.29ns/km	d) 8.23ns/km	: b
110	Chromatic dispersion is also called as intermodal dispersion. State whether the given statement true or false.	a) True	b) False			: b
111	Chromatic dispersion is also called as intermodal dispersion. State true or false	a) True	b) False			: b
112	The optical source used in a fiber is an injection laser with a relative spectral width σ⁄λ of 0.0011 at a wavelength of 0.70μm. Estimate the RMS spectral width.	a) 1.2 nm	b) 1.3 nm	c) 0.77 nm	d) 0.98 nm	: c
113	In waveguide dispersion, refractive index is independent of	a) Bit rate	b) Index difference	c) Velocity of medium	d) Wavelength	: d
114	Intermodal dispersion occurring in a large amount in multimode step index fiber results in	Propagation of the fiber	b) Propagating through the fiber	c) Pulse broadening at output	d) Attenuation of waves	: c
115	After Total Internal Reflection the Meridional ray	a) Makes an angle equal to acceptance angle with the axial ray	b) Makes an angle equal to critical angle with the axial ray	c) Travels parallel equal to critical angle with the axial ray	d) Makes an angle equal to critical angle with the axial ray	: d
116	Consider a single mode fiber having core refractive index n1= 1.5.	a) 1.00μsec	b) 0.06μsec	c) 0.90μsec	d) 0.30μsec	: b
	The fiber length is 12m. Find the time taken by the axial ray to travel along the fiber					

117	A 4 km optical link consists of multimode step index fiber with core refractive index of 1.3 and a relative refractive index difference of 1%. Find the delay difference between the slowest and fastest modes at the fiber output.	a) 0.173 μsec	b) 0.152 μsec	c) 0.96 μsec	d) 0.121 μsec	: a
118	A multimode step-index fiber has a core refractive index of 1.5 and relative refractive index difference of 1%. The length of the optical link is 6 km. Estimate the RMS pulse broadening due to intermodal dispersion on the link.	a) 92.6 ns	b) 86.7 ns	c) 69.3 ns	d) 68.32 ns	: b
119	The differential attenuation of modes reduces intermodal pulse broadening on a multimode optical link. State whether the given statement is true or false.	a) True	b) False			: a
120	The index profile of a core of multimode graded index fiber is given by-	a) $N(r) = n1 [1 - 2\Delta(r_2/a)_2]_{1/2}$; r<a	b) $N(r) = n1 [3 - 2\Delta(r_2/a)_2]_{1/2}$; r<a	c) $N(r) = n1 [5 - 2\Delta(r_2/a)_2]_{1/2}$; r>a	d) $N(r) = n1 [1 - 2\Delta(r_2/a)_2]_{1/2}$; r<a	: d
121	Intermodal dispersion in multimode fibers is minimized with the use of step-index fibers. State whether the given statement is true or false.	a) True	b) False			: b
122	Estimate RMS pulse broadening per km due to intermodal dispersion for multimode step index fiber where length of fiber is 4 km and pulse broadening per km is 80.6 ns.	a) 18.23ns/km	b) 20.15ns/km	c) 26.93ns/km	d) 10.23ns/km	: b
123	Practical pulse broadening value for graded index fiber lies in the range of	a) 0.9 to 1.2 ns/km	b) 0.2 to 1 ns/km	c) 0.23 to 5 ns/km	d) 0.45 to 8 ns/km	View : b
124	The nonlinear effects in optical fibers are large. State whether the given statement is true or false.	a) True	b) False			: b
125	How many categories of nonlinear effects are seen in optical fibers?	a) One	b) Two	c) Three	d) Four	: b
126	Which of the following is not related to Kerr effects?	a) Self-phase modulation	b) Cross-phase modulation	c) Four-wave mixing	d) Stimulated Raman Scattering	: d
127	Linear scattering effects are _____ in nature.	a) Elastic	b) Non-Elastic	c) Mechanical	d) Electrical	: a
128	Which thing is more dominant in making a fiber function as bidirectional optical amplifier?	a) Core material	b) Pump source	c) Cladding material	d) Diameter of fiber	: b
129	_____ semiconductor laser sources generally have broader bandwidths.	a) Injection	b) Pulsed	c) Solid-state	d) Silicon hybrid	: b
130	Nonlinear effects which are defined by the intensity – dependent refractive index of the fiber are called as	a) Scattering effects	b) Kerr effects	c) Raman effects	d) Tomlinson effects	: b

131	Self-phase modulation causes modifications to the pulse spectrum. State whether the given statement is true or false.	a) True	b) False			: a
132	Self-phase modulation can be used for	a) Enhancing the core diameter	b) Wavelength shifting	c) Decreasing the attenuation	d) Reducing the losses in the fiber	: b
133	The beating between light at different frequencies or wavelengths in multichannel fiber transmission causes	a) Attenuation	b) Amplitude modulation of channels	c) Phase modulation of channels	d) Loss in transmission	: c
134	What is different in case of cross-phase modulation from self-phase modulation?	a) Overlapping but same pulses	b) Overlapping but distinguishable pulses	c) Non-overlapping and same pulses	d) Non-overlapping but distinguishable pulses	: b
135	When three wave components co-propagate at angular frequency w1, w2, w3, then a new wave is generated at frequency w4, which is given by	a) w4 = w1-w2-w3	b) w4 =w1+w2+w3	c) w4 =w1+w2-w3	d) w4 =w1-w2+w3	: c
136	_____ results from case of nonlinear dispersion compensation in which the nonlinear dispersion compensation in which the nonlinear dispersion compensation in which the nonlinear chirp caused by self-phase modulation balances, postpones, the temporal broadening induced by group velocity delay.	a) Four wave mixing	b) Phase modulation	c) Soliton propagation	d) Raman scattering	: c
137	What is a fundamental necessity in the fabrication of fibers for light transmission?	a) Same refractive index for both core and cladding.	b) Pump source	c) Material composition of fiber	d) Variation of refractive index inside the optical fiber	: d
138	Which materials are unsuitable for the fabrication of graded index fiber?	a) Glass-like-materials	b) Mono-crystalline structures	c) Amorphous material	d) Silica based material	: b
139	How many different categories are available for the methods of preparing optical glasses?	a) 1	b) 2	c) 3	d) 4	: b
140	What is the first stage in liquid-phase-technique?	a) Preparation of ultra-pure material powders	b) Melting of materials	c) Decomposition	d) Crystallization	: a
141	Which processes are involved in the purification stage in liquid-phase-technique?	a) Filtration, Co-precipitation, Re-crystallization	b) Decomposition, Filtration, Drying	c) Doping, Drying, Decomposition	d) Filtration, Drying, Doping	: a
142	At what temperature range, does the melting of multi components glass systems takes place?	a) 100-300 degree Celsius	b) 600-800 degree Celsius	c) 900-1300 degree Celsius	d) 1500-1800 degree Celsius	: c
143	Fiber drawing using preform was useful for the production of graded index fibers. State whether the given statement is true or false.	a) True	b) False			: b
144	The minute perturbations and impurities in the fiber drawing process using preform technique can result in very high losses of	a) Between 500 and 1000 dB/km	b) Between 100 and 300 dB/km	c) Between 1200 and 1600 dB/ km	d) More than 2000 dB/km	: a
145	The liquid-phase melting technique is used for the production of fibers	a) With a core diameter of 50μm.	b) With a core diameter less than 100μm.	c) With a core diameter more than 200μm.	d) With a core diameter of 100μm.	: c

146	Graded index fibers produced by liquid-phase melting technique are less dispersive than step-index fibers. State whether the given statement is true or false.	a) True	b) False			: a
147	Which of the following is not a technique for fabrication of glass fibers?	a) Vapor phase oxidation method	b) Direct melt method	c) Lave ring method	d) Chemical vapor deposition technique	: c
148	_____ technique is method of preparing extremely pure optical glasses.	a) Liquid phase (melting)	b) Radio frequency induction	c) Optical attenuation	d) Vapor Phase Deposition (VPD)	: d
149	Which of the following materials is not used as a starting material in vapor-phase deposition technique?	a) $SiCl_4$	b) $GeCl_4$	c) O_2	d) $B2O_3$	: d
150	P_2O_5 is used as a _____	a) Dopant	b) Starting material	c) Cladding glass	d) Core glass	: a
151	How many types of vapor-phase deposition techniques are present?	a) One	b) Two	c) Three	d) Four	: b
152	_____ uses flame hydrolysis stems from work on soot processes which were used to prepare the fiber with losses below 20 dB/km.	a) Outside vapor phase oxidation	b) Chemical vapor deposition	c) Liquid phase melting	d) Crystallization	: a
153	Complete the given reaction $SiCl_4 + 2H_2O \rightarrow SiO_2 +$ _____	a) 2HCl	b) 4HCl	c) $2Cl_2$	d) $4Cl_2$	: b
154	In modified chemical vapor deposition, vapor phase reactant such as _____ pass through a hot zone.	a) Halide and oxygen	b) Halide and hydrogen	c) Halide and silica	d) Hydroxides and oxygen	: a
155	_____ is the stimulation of oxide formation by means of non-isothermal plasma maintained at low pressure in a microwave cavity surrounding the tube.	a) Outside Vapor Phase Oxidation (OVPO)	b) Vapor Axial Deposition (VAD)	c) Modified Chemical Vapor Deposition (MCVD)	d) Plasma-activated Chemical Vapor Deposition (PCVD)	: d
156	Only graded index fibers are made with the help of vapor-phase deposition techniques. State whether true or false.	a) True	b) False			: b
157	Modified Chemical Vapor Deposition (MCVD) process is also called as an inside vapor phase oxidation (IVPD) technique. State whether the given statement is true or false.	a) True	b) False			: a
158	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	: a
159	. 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	: c

160	A multimode step index fiber has a large core diameter of range	a) 100 to 300 µm	b) 100 to 300 nm	c) 200 to 500 µm	d) 200 to 500 nm	: a
161	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	: b
162	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.	: b
163	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	: a
164	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.	: b
	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.					
	: b					
165	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) 100µm/140 µm	c) 85 µm/ 125 µm	d) 50 µm/ 125µm	: b
166	Multimode graded index fibers use incoherent source only. State whether the following statement is true or false.	a) True	b) False			: b
167	In single mode fibers, the most beneficial index profile is	a) Step index	b) Graded index	c) Step and graded index	d) Coaxial cable	: b
168	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	: a
169	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	: d
170	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	: b
171	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	: c
172	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	: b
173	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	: b
174	It is not important to cover these optical fibers required for transmission. State whether the given statement is true or false.	a) True	b) False			: b

175	Optical fibers for communication use are mostly fabricated from	a) Plastic	b) Silica or multicomponent glass	c) Ceramics	d) Copper	: b
176	An Si-O bond with a Young's modulus of $9*10^{10}Nm^{-1}$ have an elliptical crack of depth 7nm. The surface energy is 2.29 J. Estimate fracture stress for silica fiber.	a) $4.32*10^{9}Nm^{-1}$	b) $6.32*10^{9}Nm^{-1}$	c) $5.2*10^{9}Nm^{-1}$	d) $3*10^{9}Nm^{-1}$	: a
177	Calculate percentage strain at break for a Si-O bond with a fracture strength of $3.52*10^{10}Nm^{-1}$ and Young's modulus of $9*10^{9}Nm^{-1}$.	a) 3.1 %	b) 2.8 %	c) 4.5 %	d) 3.9 %	: d
178	Stress corrosion must be considered while designing and testing optical fiber cables. State whether the given statement is true or false.	a) True	b) False			: a
179	Which statistics are used for calculations of strengths of optical fibers?	a) Edwin statistics	b) Newton statistics	c) Wei-bull statistics	d) Gamma statistics	: c
180	What does n denotes in the equation given below, if v_c is the crack velocity; A is the constant for the fiber material and KI is the strength intensity factor?	a) Refractive index	b) Stress corrosion susceptibility	c) Strain	d) Young's modulus	: b
181	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	: b
182	It is not important to cover these optical fibers required for transmission. State whether the given statement is true or false.	a) True	b) False			: b
183	Optical fibers for communication use are mostly fabricated from	a) Plastic	b) Silica or multicomponent glass	c) Ceramics	d) Copper	: b
184	An Si-O bond with a Young's modulus of $9*10^{10}Nm^{-1}$ have an elliptical crack of depth 7nm. The surface energy is 2.29 J. Estimate fracture stress for silica fiber.	a) $4.32*10^{9}Nm^{-1}$	b) $6.32*10^{9}Nm^{-1}$	c) $5.2*10^{9}Nm^{-1}$	d) $3*10^{9}Nm^{-1}$	: a
185	Calculate percentage strain at break for a Si-O bond with a fracture strength of $3.52*10^{10}Nm^{-1}$ and Young's modulus of $9*10^{9}Nm^{-1}$.	a) 3.1 %	b) 2.8 %	c) 4.5 %	d) 3.9 %	: d
186	Stress corrosion must be considered while designing and testing optical fiber cables. State whether the given statement is true or false.	a) True	b) False			: a
187	Which statistics are used for calculations of strengths of optical fibers?	a) Edwin statistics	b) Newton statistics	c) Wei-bull statistics	d) Gamma statistics	: c

188	What does n denotes in the equation given below, if v_c is the crack velocity; A is the constant for the fiber material and KI is the strength intensity factor?	a) Refractive index	b) Stress corrosion susceptibility	c) Strain	d) Young's modulus	: b
	$v_c = AK_I^n$					
189	. _____ results from small lateral forces exerted on the fiber during the cabling process.	a) Attenuation	b) Micro-bending	c) Dispersion	d) Stimulated Emission	: b
190	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	: a
191	How many forms of modal power distribution are considered?	a) One	b) Two	c) Three	d) Four	: b
192	What does micro-bending losses depend on?	a) Core material	b) Refractive index	c) Diameter	d) Mode and wavelength	: d
193	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	: a
194	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	: b
195	_____ can induce a considerable amount of attenuation in optical fibers.	a) Micro-bending	b) Dispersion	c) Diffusion of hydrogen	d) Radiation Exposure	: d
196	The radiation-induced attenuation can be reduced through photo-bleaching. State whether the given statement is true or false.	a) True	b) False			: a
197	The losses due to hydrogen absorption and reaction with fiber deposits can be temporary. State whether the given statement is true or false.	a) True	b) False			: b
198	The losses caused due to hydrogen absorption mechanisms are in the range of	a) 20 dB/km to25 dB/km	b) 10 dB/km to15 dB/km	c) 25 dB/km to50 dB/km	d) 0 dB/km to5 dB/km	: c
199	The cable must be designed such that the strain on the fiber in the cable does not exceed_____	a) 0.002%	b) 0.01%	c) 0.2%	d) 0.160%	: c
200	How many categories exists in case of cable design?	a) Two	b) Three	c) One	d) Four	: b
201	How many types of buffer jackets are used in fiber buffering?	a) Three	b) One	c) Two	d) Four	: a
202	Loose tube buffer jackets exhibits a low resistance to movement of the fiber. State whether the given statement is true or false.	a) True	b) False			: a

203	An inclusion of one or more structural members in an optical fiber so as to serve as a cable core foundation around which the buffer fibers may be wrapped is called _____	a) Attenuation	b) Splicing	c) Buffering	d) Stranding	: d
204	Which of the following is not a strength member used in optical cable?	a) Steel wire	b) Germanium	c) Aramid yarns	d) Glass elements	: b
205	When the stranding approach consists of individual elements (e.g. single-fiber or multi fiber loose tube buffer) than the cable is termed as	a) Optical unit cable	b) Coaxial cable	c) Layer cable	d) Bare glass cable	: c
206	The primary function of the structural member is load bearing. State whether the given statement is true or false.	a) True	b) False			: b
207	What is the Young's modulus of Kevlar, an aromatic polyester?	a) 9 $\times 10^{10} Nm^{-2}$	b) 10 $\times 10^{10} Nm^{-2}$	c) 12 $\times 10^{10} Nm^{-2}$	d) 13 $\times 10^{10} Nm^{-2}$	: d
208	The cable is normally covered with an outer plastic sheath to reduce _____	a) Abrasion	b) Armor	c) Friction	d) Dispersion	: a
209	A measure of amount of optical fiber emitted from source that can be coupled into a fiber is termed as	a) Radiance	b) Angular power distribution	c) Coupling efficiency	d) Power-launching	: c
210	The ratio r = (n1 – n)/ (n1 – n) indicates	a) Fresnel reflection	b) Reflection coefficient	c) Refraction coefficient	d) Angular power distribution coefficient	: b
211	A GaAs optical source having a refractive index of 3.2 is coupled to a silica fiber having a refractive index of 1.42. Determine Fresnel reflection at interface in terms of percentage.	a) 13.4%	b) 17.4%	c) 17.6%	d) 14.8%	: d
212	A particular GaAs fiber has a Fresnel reflection magnitude of 17.6% i.e. 0.176. Find the power loss between the source and the fiber?	a) 0.86 dB	b) 0.78 dB	c) 0.84 dB	d) 0.83 dB	: c
213	Two joined step index fibers are perfectly aligned. What is the coupling loss of numerical aperture are NA_R= 0.26 for emitting fiber?	a) -0.828 dB	b) -0.010 dB	c) -0.32 dB	d) 0.32 dB	: b
214	Two joined graded index fibers that are perfectly aligned have refractive indices α_R=1.93for receiving fiber α_E= 2.15 for emitting fiber. Calculate the coupling loss	a) 0.23 dB	b) 0.16 dB	c) 0.82 dB	d) 0.76 dB	: a
215	How many types of misalignments occur when joining compatible fiber?	a) One	b) Two	c) Five	d) Three	: d
216	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	: a

217	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	: c
218	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	: d
219	Determine coupling efficiency if the misalignment loss in a graded index fiber is 0.102	a) 0.136	b) 0.898	c) 0.982	d) 0.684	: b
220	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	: a
221	The intrinsic loss through a multimode fiber joint is independent of direction of propagation. State whether the given statement is true or false	a) True	b) False			: b
222	The expanded beam connectors use _____ for beam expansion and reduction.	a) Square micro-lens	b) Oval micro-lens	c) Spherical micro-lens	d) Rectangular micro-lens	: c
223	Lens-coupled expanded beam connectors exhibit average losses of _____ in case of single mode and graded index fibers.	a) 0.3 dB	b) 0.7 dB	c) 0.2 dB	d) 1.5 dB	: b
224	Sapphire ball lens expanded beam design is successful than spherical lens coupled design. State whether the given statement is true or false.	a) True	b) False			: a
225	The fiber is positioned at the _____ of the lens in order to obtain a collimated beam and to minimize lens-to-lens longitudinal misalignment effects.	a) Aperture	b) Focal length	c) Curve	d) Exterior circumference	: b
226	_____ exhibits a parabolic refractive index profile with a maximum at the axis similar to graded index fiber.	a) Lens coupled design	b) Sapphire ball lens	c) Spherical micro-lens	d) GRIN-rod lens	: d
227	The GRIN-rod lens can produce a collimated output beam with a divergent angle αof between _____ from a light source situated on, or near to, the opposite lens face.	a) 1 to 5 degrees	b) 9 to 16 degrees	c) 4 to 8 degrees	d) 25 to 50 degrees	: a
228	In the given equation, if r is the radial distance, n is the refractive index; what does z stands for?	a) Focal length	b) Distance along the optical axis	c) Axial angle	d) Diameter	: b
	$dr^2/dz^2 = (1/n)(d\,n/dr)$					
229	The majority of the GRIN-rod lenses have diameters in the range of _____	a) 2 to 2.5 mm	b) 3 to 4 mm	c) 0.1 to 0.4 mm	d) 0.5 to 2 mm	: d

230	Which of the following factors does not cause divergence of the collimated beam from a GRIN-rod lens?	a) Lens cut length	b) Size of fiber core	c) Refractive index profile	d) Chromatic aberration	: c
231	GRIN-rod lens connectors have loss characteristics which are independent of the modal power distribution in the fiber. State whether the given statement is true or false.	a) True	b) False			: a
232	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	: a
233	How many types of fiber splices are available?	a) One	b) Two	c) Three	d) Four	: b
234	The insertion losses of the fiber splices are much less than the Fresnel reflection loss at a butted fiber joint. State whether the given statement is true or false.	a) True	b) False			: a
235	What is the main requirement with the fibers that are intended for splicing?	a) Smooth and oval end faces	b) Smooth and square end faces	c) Rough edge faces	d) Large core diameter	: b
236	In score and break process, which of the following is not used as a cutting tool?	a) Diamond	b) Sapphire	c) Tungsten carbide	d) Copper	: d
237	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	: b
238	Which of the following is not used as a flame heating source in fusion splicing?	a) Microprocessor torches	b) Ox hydric burners	c) Electric arc	d) Gas burner	: d
239	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	: a
240	_____ 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	: b
241	Mean splice insertion losses of 0.05 dB are obtained using multimode graded index fibers with the Springroove splice. State whether the given statement is true or false.	a) True	b) False			: a
242	Alignment accuracy of the order _____ is obtained using the three glass rod alignment sleeve.	a) 0.23 μm	b) 0.15 μm	c) 0.05 μm	d) 0.01 μm	: c

243	In case of multiple fusion, splice losses using an electric arc fusion device with multimode graded index fiber range from	a) 0.01 to 0.04 dB	b) 0.19 to 0.25 dB	c) 0.12 to 0.15 dB	d) 0.04 to 0.12 dB	: d
244	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	: a
245	How many types of fiber splices are available?	a) One	b) Two	c) Three	d) Four	: b
246	The insertion losses of the fiber splices are much less than the Fresnel reflection loss at a butted fiber joint. State whether the given statement is true or false.	a) True	b) False			: a
247	What is the main requirement with the fibers that are intended for splicing?	a) Smooth and oval end faces	b) Smooth and square end faces	c) Rough edge faces	d) Large core diameter	: b
248	In score and break process, which of the following is not used as a cutting tool?	a) Diamond	b) Sapphire	c) Tungsten carbide	d) Copper	: d
249	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	: b
250	Which of the following is not used as a flame heating source in fusion splicing?	a) Microprocessor torches	b) Ox hydric burners	c) Electric arc	d) Gas burner	: d
251	The rounding of the fiber ends with a low energy discharge before pressing the fibers together and fusing with a stronger arc is called as	a) Pre-fusion	b) Diffusion	c) Crystallization	d) Alignment	: a
252	_____ is caused by surface tension effects between the two fiber ends during fusing.	a) Pre-fusion	b) Diffusion	c) Self-alignment	d) Splicing	: c
253	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	: a
254	_____ 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	: b
255	Mean splice insertion losses of 0.05 dB are obtained using multimode graded index fibers with the Springroove splice. State whether the given statement is true or false.	a) True	b) False			: a
256	Alignment accuracy of the order _____ is obtained using the three glass rod alignment sleeve.	a) 0.23 μm	b) 0.15 μm	c) 0.05 μm	d) 0.01 μm	: c

257	In case of multiple fusion, splice losses using an electric arc fusion device with multimode graded index fiber range from	a) 0.01 to 0.04 dB	b) 0.19 to 0.25 dB	c) 0.12 to 0.15 dB	d) 0.04 to 0.12 dB	: d
258	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	: b
259	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	: a
260	Optical fiber couplers are also called as _____	a) Isolators	b) Circulators	c) Directional couplers	d) Attenuators	: c
261	How many types of multiport optical fiber couplers are available at present?	a) Two	b) One	c) Four	d) Three	: d
262	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	: d
263	_____ 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	: c
264	How many fabrication techniques are used for 3 port fiber couplers?	a) One	b) Two	c) Three	d) Four	: b
265	The most common method for manufacturing couplers is _____	a) Wavelength division multiplexing	b) Lateral offset method	c) Semitransparent mirror method	d) Fused bi-conical taper (FBT) technique	: d
265	Couplers insertion loss is same as that of excess loss. State whether the given statement is true or false.	a) True	b) False			: b
266	A four-port multimode fiber FBT coupler has 50 μWoptical 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	: a
267	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%	: d
268	How many manufacturing methods are used for producing multimode fiber star couplers?	a) Two	b) One	c) Three	d) Five	: a
269	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	: c

270	14. A _____ coupler comprises a number of cascaded stages, each incorporating three or four-port FBT couplers to obtain a multiport output.	a) Star	b) Ladder	c) WDM	d) Three-port	: a	
271	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	: d	
272	An FBG is developed within a fiber core having a refractive index of 1.30. Find the grating period for it to reflect an optical signal with a wavelength of 1.33μm.	a) 0.51 μm	b) 0.58 μm	c) 0.61 μm	d) 0.49 μm	: a	
273	It is a passive device which allows the flow of optical signal power in only one direction and preventing reflections in the backward direction.	a) Fiber slice	b) Optical fiber connector	c) Optical isolator	d) Optical coupler	: c	
274	Which feature of an optical isolator makes it attractive to use with optical amplifier?	a) Low loss	b) Wavelength blocking	c) Low refractive index	d) Attenuation	: b	
275	Magneto-optic devices can be used to function as isolators. State whether the given statement is true or false.	a) True	b) False			: a	
276	How many implementation methods are available for optical isolators?	a) One	b) Four	c) Two	d) Three	: d	
277	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	: a	
278	The commercially available circulators exhibit insertion losses around _____	a) 2 dB	b) 0.7 dB	c) 0.2 dB	d) 1 dB	: d	
279	A combination of a FBG and optical isolators can be used to produce non-blocking optical wavelength division add/ draw multiplexers. State whether the given statement is true or false.	a) True	b) False			: b	
280	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	: a	
281	How many types of sources of optical light are available?	a) One	b) Two	c) Three	d) Four	: c	
282	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?	a) Gravitation constant	b) Planck's constant	c) Permittivity	d) Attenuation constant	: b	h = 6.626×10
	$E = E_2 – E_1 = hf$						

283	The radiation emission process (emission of a proton at frequency) can occur in _____ ways.	a) Two	b) Three	c) Four	d) One	: a
284	Which process gives the laser its special properties as an optical source?	a) Dispersion	b) Stimulated absorption	c) Spontaneous emission	d) Stimulated emission	: d
285	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}	: b
286	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	: c
287	_____ 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	: a
288	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}	: d
289	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	: c
290	Doppler broadening is a homogeneous broadening mechanism. State whether the given statement is true or false.	a) True	b) False			: b
291	An injection laser has active cavity losses of 25 cm-1and the reflectivity of each laser facet is 30%. Determine the laser gain coefficient for the cavity it has a length of 500μm.	a) 46 cm^{-1}	b) 51 cm^{-1}	c) 50 cm^{-1}	d) 49.07 cm^{-1}	: d
292	Longitudinal modes contribute only a single spot of light to the laser output. State whether the given statement is true or false.	a) True	b) False			: a
293	Considering the values given below, calculate the mode separation in terms of free space wavelength for a laser.	a) 1.4×10^{-11}	b)1.6×10^{-12}	c) 1×10^{-12}	d) 6×10^{-11}	: b
	Frequency separation = 2GHz					
	Wavelength = 0.5 μm.					
294	_____ lasers are presently the major laser source for optical fiber communications	a) Semiconductor	b) Non-Semiconductor	c) Injection	d) Solid-state	: c
295	In Nd: YAG lasers, the maximum doping levels of neodymium is _____	a) 0.5 %	b) 1.5 %	c) 1.8 %	d) 2 %	: b

296	Which of the following is not a property of Nd: YAG laser that enables its use as an optical fiber communication source?	a) Single mode operation	b) Narrow line-width	c) Long lifetime	d) Semiconductors and integrated circuits	: d
297	The Nd: YAG laser has a narrow line-width which is _____	a) < 0.01 nm	b) > 0.01 nm	c) > 1 mm	d) > 1.6 mm	: a
298	The strongest pumping bands is a four level system of Nd: YAG laser at wavelength of range_____	a) 0.25 and 0.56 nm	b) 0.75 and 0.81 nm	c) 0.12 and 0.23 nm	d) 1 and 2 nm	: b
299	The Nd: YAG laser is costlier than earth-doped glass fiber laser. State whether the following statement is true or false	a) True	b) False			: a
300	It is a resonant cavity formed by two parallel reflecting mirrors separated by a mirror separated by a medium such as air or gas	a) Optical cavity	b) Wheatstone's bridge	c) Oscillator	d) Fabry-perot resonator	: d
301	In a three level system, the threshold power decreases inversely with the length of the fiber gain medium. State whether the given statement is true or false.	a) True	b) False			: b
302	9. Which of the following co-dopant is not employed by neodymium and erbium doped silica fiber lasers?	a) Phosphorus pent oxide	b) Germania	c) Nitrogen	d) Alumina	: c
303	Dopants levels in glass fiber lasers are generally _____	a) Low	b) High	c) Same as that of GRIN rod lens laser	d) Same as that of semiconductor laser	: a
304	. _____ fibers include addition of lead fluoride to the core glass in order to raise the relative refractive index.	a) Solid-state	b) GaAs	c) Semiconductor	d) ZBLANP	: d
305	The lasing output of the basic Fabry-perot cavity fiber is restricted to between _____	a) 1 and 2 nm	b) 5 and 10 nm	c) 3 and 6 nm	d) 15 and 30 nm	: b
306	In Fabry-perot laser, the lower threshold is obtained by	a) Increasing the refractive index	b) Decreasing the refractive index	c) Reducing the slope efficiency	d) Increasing the slope efficiency	: c
307	When did the non-semiconductor laser developed?	a) 1892	b) 1946	c) 1985	d) 1993	: c
308	$Y_3Al_5O_{12}$ Is a molecular formula for _____	a) Ytterbium aluminate	b) Yttrium oxide	c) Ytterbium oxy-aluminate	d) Yttrium-aluminum garnet	: d
309	A perfect semiconductor crystal containing no impurities or lattice defects is called as	a) Intrinsic semiconductor	b) Extrinsic semiconductor	c) Excitation	d) Valence electron	: a
310	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	: c
311	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	: b

312	The majority of the carriers in a p-type semiconductor are_____.	a) Holes	b) Electrons	c) Photons	d) Neutrons	: a
313	_____ is used when the optical emission results from the application of electric field.	a) Radiation	b) Efficiency	c) Electro-luminescence	d) Magnetron oscillator	: c
314	In the given equation, what does p stands for?	a) Permittivity	b) Probability	c) Holes	d) Crystal momentum	: d
	p=2πhk					
315	The recombination in indirect band-gap semiconductors is slow. State whether the given statement is true or false.	a) True	b) False			: True
316	Calculate the radioactive minority carrier lifetime in gallium arsenide when the minority carriers are electrons injected into a p-type semiconductor region which has a hole concentration of $10^{18}cm^{-3}$. The recombination coefficient for gallium arsenide is	a) 2ns	b) 1.39ns	c) 1.56ns	d) 2.12ms	: b
	$7.21*10^{-10}cm^{3s-1}$.					
317	Which impurity is added to gallium phosphide to make it an efficient light emitter?	a) Silicon	b) Hydrogen	c) Nitrogen	d) Phosphorus	: c
318	Population inversion is obtained at a p-n junction by	a) Heavy doping of p-type material	b) Heavy doping of n-type material	c) Light doping of p-type material	d) Heavy doping of both p-type and n-type material	: d
319	A GaAs injection laser has a threshold current density of $2.5*10^{3}Acm^{-2}$and length and width of the cavity is 240μmand 110μm respectively. Find the threshold current for the device.	a) 663 mA	b) 660 mA	c) 664 mA	d) 712 mA	: b
320	A GaAs injection laser with an optical cavity has refractive index of 3.6. Calculate the reflectivity for normal incidence of the plane wave on the GaAs-air interface.	a) 0.61	b) 0.12	c) 0.32	d) 0.48	: c
321	A homo-junction is an interface between two adjoining single-crystal semiconductors with different band-gap energies. State whether the given statement is true or false.	a) True	b) False			: b
322	How many types of hetero-junctions are available?	a) Two	b) One	c) Three	d) Four	: a
323	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	: d
324	Stimulated emission by recombination of injected carriers is encouraged in	a) Semiconductor injection laser	b) Gas laser	c) Chemist laser	d) Dye laser	: a

325	In semiconductor injection laser, narrow line bandwidth is of the order	a) 1 nm or less	b) 4 nm	c) 5 nm	d) 3 nm	: a
326	Injection laser have a high threshold current density of	a) $10^{4}Acm^{-2}$and more	b) $10^{2}Acm^{-2}$	c) $10^{-2}Acm^{-2}$	d) $10^{-3}Acm^{-2}$	: a
327	η_T Is known as slope quantum efficiency. State true or false	a) True	b) False			: b
328	The total efficiency of an injection laser with GaAs active region is 12%. The applied voltage is 3.6 V and band gap energy for GaAs is 2.34 eV. Determine external power efficiency.	a) 7.8 %	b) 10 %	c) 12 %	d) 6 %	: a
329	In a DH laser, the sides of cavity are formed by _____	a) Cutting the edges of device	b) Roughening the edges of device	c) Softening the edges of device	d) Covering the sides with ceramics	: b
330	A particular laser structure is designed so that the active region extends the edges of devices. State whether the following statement is true or false.	a) True	b) False			: a
331	Gain guided laser structure are	a) Chemical laser	b) Gas laser	c) DH injection laser	d) Quantum well laser	: c
332	Laser modes are generally separated by few	a) Tenths of micrometer	b) Tenths of nanometer	c) Tenths of Pico-meter	d) Tenths of millimeter	: b
333	The spectral width of emission from the single mode device is	a) Smaller than broadened transition line-width	b) Larger than broadened transition line-width	c) Equal the broadened transition line-width	d) Cannot be determined	: a
334	Single longitudinal mode operation is obtained by	a) Eliminating all transverse mode	b) Eliminating all longitudinal modes	c) Increasing the length of cavity	d) Reducing the length of cavity	: d
335	A correct DH structure will restrict the vertical width of waveguide region	a) 0.5μm.	b) 0.69 μm	c) 0.65 μm	d) Less than 0.4 μm	: d
336	The external power efficiency of an injection laser with a GaAs is 13% having band gap energy of 1.64 eV. Determine external power efficiency	a) 0.198	b) 0.283	c) 0.366	d) 0.467	: a
337	The strip width of injection laser is	a) 12 μm	b) 11.5 μm	c) Less than 10 μm	d) 15 μm	: c
338	Some refractive index variation is introduced into lateral structure of laser. State whether the given statement is true or false.	a) True	b) False			: a
339	Buried hetero-junction (BH) device is a type of _____ laser where the active volume is buried in a material of wider band-gap and lower refractive index.	a) Gas lasers.	b) Gain guided lasers.	c) Weak index guiding lasers.	d) Strong index guiding lasers.	: d

340	In Buried hetero-junction (BH) lasers, the optical field is confined within	a) Transverse direction.	b) Lateral direction.	c) Outside the strip.	d) Both transverse and lateral direction.	: d
341	A double-channel planar buried hetero-structure (DCP BH) has a planar active region, the confinement material is	a) Alga AS	b) InGaAsP	c) GaAs	d) SiO_2	: b
342	Problems resulting from parasitic capacitances can be overcome	a) Through regrowth of semi-insulating material.	b) By using oxide material.	c) By using a planar InGaAsP active region.	d) By using a AlGaAs active region.	: a
343	Quantum well lasers are also known as	a) BH lasers.	b) DH lasers.	c) Chemical lasers.	d) Gain-guided lasers.	: b
344	Quantum well lasers are providing high inherent advantage over	a) Chemical lasers.	b) Gas lasers.	c) Conventional DH devices.	d) BH device.	: c
345	Strip geometry of a device or laser is important. State whether the given statement is true or false.	a) True	b) False			: a
346	Better confinement of optical mode is obtained in	a) Multi Quantum well lasers.	b) Single Quantum well lasers.	c) Gain guided lasers.	d) BH lasers.	: a
347	Multi-quantum devices have superior characteristics over	a) BH lasers.	b) DH lasers.	c) Gain guided lasers.	d) Single-quantum-well devices.	: b
348	Dot-in-well device is also known as	a) DH lasers.	b) BH lasers.	c) QD lasers.	d) Gain guided lasers.	: c
349	A BH can have anything from a single electron to several electrons. State whether the given statement is true or false.	a) True	b) False			: b
350	QD lasers have a very low threshold current densities of range	a) 0.5 to 5 A cm^{-2}	b) 2 to 10 A cm^{-2}	c) 10 to 30 A cm^{-2}	d) 6 to 20 A cm^{-2}	: d
351	_____ may be improved through the use of frequency-selective feedback so that the cavity loss is different for various longitudinal modes.	a) Frequency selectivity	b) Longitudinal mode selectivity	c) Electrical feedback	d) Dissipated power	: b
352	Device which apply the frequency-selective feedback technique to provide single longitudinal operation are referred to as _____	a) DSM lasers	b) Nd: YAG lasers	c) Glass fiber lasers	d) QD lasers	: a
353	Which of the following does not provide single frequency operation?	a) Short cavity resonator	b) DSM lasers	c) Coupled cavity resonator	d) Fabry-Perot resonator	: d
354	A method for increasing the longitudinal mode discrimination of an injection laser which is commonly used?					
355	Conventional cleaved mirror structures are difficult to fabricate with the cavity lengths below	a) 200μmand greater than 150 μm	b) 100 μm and greater than 50 μm	c) 50 μm	d) 150 μm	: c

356	In the given equation, corrugation period is given by $l\lambda_b/2N_e$. If λb is the Bragg wavelength, then what does 'l' stand for?	a) Length of cavity	b) Limitation index	c) Integer order of grating	d) Refractive index	: c
357	The first order grating (l=1) provide the strongest coupling within the device. State whether the given statement is true or false.	a) True	b) False			: a
358	The semiconductor lasers employing the distributed feedback mechanism are classified in _____ categories	a) One	b) Two	c) Three	d) Four	: b
359	DBF-BH lasers exhibit low threshold currents in the range of _____	a) 40 to 50 mA	b) 21 to 30 mA	c) 2 to 5 mA	d) 10 to 20 mA	: d
360	Fabry-Perot devices with BH geometries high modulation speeds than DFB-BH lasers. State whether the given statement is true or false	a) True	b) False			: b
361	The InGaAsP/InP double channel planar DFB-BH laser with a quarter wavelength shifted first order grating provides a single frequency operation and incorporates a phase shift of _____	a) π/2 Radians	b) 2π Radians	c) π Radians	d) 3π/2 radians	: a
362	The narrow line-width obtained under the CW operation for quarter wavelength shifted DFB laser is _____	a) 2 MHz	b) 10 MHz	c) 3 MHz	d) 1 MHz	: c
363	Line-width narrowing is achieved in DFB lasers by a strategy referred as _____	a) Noise partition	b) Grating	c) Tuning	d) Bragg wavelength detuning	: d
364	_____ is a technique used to render the non-conducting material around the active cavity by producing permanent defects in the implanted area	a) Dispersion	b) Ion de-plantation	c) Ion implantation	d) Attenuation	: c
365	The threshold temperature coefficient for InGaAsP devices is in the range of	a) 10-40 K	b) 40-75 K	c) 120-190 K	d) 150-190 K	: b
366	The process where the energy released during the recombination of an electron-hole event getting transferred to another carrier is known as	a) Inter-valence bond absorption	b) Auger recombination	c) Carrier leakage effects	d) Exothermic actions	: b
367	Auger recombination can be reduced by using	a) Strained MQW structure.	b) Strained SQW structure.	c) Gain-guided strained structure.	d) Strained Quantum dots lasers.	: a
368	High strain in strained MCQ structure should be incorporated. State whether the given statement is true or false.	a) True	b) False			: b

369	The parameter that prevents carrier from recombination is	a) Auger recombination	b) Inter-valence band absorption	c) Carrier leakage	d) Low temperature sensitivity	: c
370	Determine the threshold current density for an AlGaAs injection laser with T0=180k at 30°C.	a) 6.24	b) 9.06	c) 3.08	d) 5.09	: d
371	The phenomenon occurring when the electron and photon population within the structure comes into equilibrium is known as	a) Auger recombination	b) Inter-valence band absorption	c) Carrier leakage	d) Relaxation oscillations	: d
372	When a current pulse reaches a laser having parasitic capacitance after the initial delay time, that pulse will	a) Have no effect	b) Will get vanished	c) Becomes narrower	d) Gets broader	: d
373	Reducing delay time and _____ are of high importance for lasers.	a) Auger recombination	b) Inter-valence band absorption	c) Carrier leakage effects	d) Relaxation oscillations	: d
374	Dynamic line-width broadening under the direct modulation of injection current is known as	a) Auger recombination	b) Inter-valence band absorption	c) Carrier leakage effects	d) Frequency Chirping	: d
375	A particular characteristic or parameter that occurs during analog transmission of injection lasers is	a) Noise	b) Mode hopping	c) Carrier leakage effects	d) Frequency Chirping	: a
376	Intensity of output from semiconductor injection lasers leading to optical intensity noise is due to	a) Fluctuations in amplitude	b) Mode hopping	c) Carrier leakage effects	d) Frequency Chirping	: a
377	In multimode lasers the optical feedback from unnecessary external reflections affecting stability of frequency and intensity is	a) Remains unaffected	b) Increased gradually	c) Reduced	d) Gets totally vanished	: c
378	Reduction in the number of modes in multimode fiber increases the mode partition noise. State whether the given statement is true or false.	a) False	b) True			: a
379	The behavior of laser occurring when current is increased above threshold particularly is	a) Mode hopping	b) Auger recombination	c) Frequency chirping	d) Noise	: a
380	_____ lasers are presently the major laser source for optical fiber communications	a) Semiconductor	b) Non-Semiconductor	c) Injection	d) Solid-state	: c
381	In Nd: YAG lasers, the maximum doping levels of neodymium is _____	a) 0.5 %	b) 1.5 %	c) 1.8 %	d) 2 %	: b
382	Which of the following is not a property of Nd: YAG laser that enables its use as an optical fiber communication source?	a) Single mode operation	b) Narrow line-width	c) Long lifetime	d) Semiconductors and integrated circuits	: d
383	The Nd: YAG laser has a narrow line-width which is _____	a) < 0.01 nm	b) > 0.01 nm	c) > 1 mm	d) > 1.6 mm	: a

384	The strongest pumping bands is a four level system of Nd: YAG laser at wavelength of range _____	a) 0.25 and 0.56 nm	b) 0.75 and 0.81 nm	c) 0.12 and 0.23 nm	d) 1 and 2 nm	: b
385	The Nd: YAG laser is costlier than earth-doped glass fiber laser. State whether the following statement is true or false	a) True	b) False			: a
386	It is a resonant cavity formed by two parallel reflecting mirrors separated by a mirror separated by a medium such as air or gas	a) Optical cavity	b) Wheatstone's bridge	c) Oscillator	d) Fabry-perot resonator	: d
387	In a three level system, the threshold power decreases inversely with the length of the fiber gain medium. State whether the given statement is true or false.	a) True	b) False			: b
388	Which of the following co-dopant is not employed by neodymium and erbium doped silica fiber lasers?	a) Phosphorus pent oxide	b) Germania	c) Nitrogen	d) Alumina	: c
389	Dopants levels in glass fiber lasers are generally _____	a) Low	b) High	c) Same as that of GRIN rod lens laser	d) Same as that of semiconductor laser	: a
390	_____ fibers include addition of lead fluoride to the core glass in order to raise the relative refractive index.	a) Solid-state	b) GaAs	c) Semiconductor	d) ZBLANP	: d
391	The lasing output of the basic Fabry-perot cavity fiber is restricted to between _____	a) 1 and 2 nm	b) 5 and 10 nm	c) 3 and 6 nm	d) 15 and 30 nm	: b
392	In Fabry-perot laser, the lower threshold is obtained by	a) Increasing the refractive index	b) Decreasing the refractive index	c) Reducing the slope efficiency	d) Increasing the slope efficiency	: c
393	When did the non-semiconductor laser developed?	a) 1892	b) 1946	c) 1985	d) 1993	: c
394	$Y_3Al_5O_{12}$ Is a molecular formula for _____	a) Ytterbium aluminate	b) Yttrium oxide	c) Ytterbium oxy-aluminate	d) Yttrium-aluminum garnet	: d
395	Which of these factors are critical in affecting the system performance in the case of coherent optical fiber transmission?	a) Laser line-width and stability	b) Refractive index and index difference	c) Core cladding diameter	d) Frequency	: a
396	_____ occurs as a result of the change in lasing frequency with gain	a) Frequency multiplication	b) Dispersion	c) Attenuation	d) Line-width broadening	: d
397	Laser cavity length can be extended by	a) Increasing the refractive index	b) Reducing frequency	c) Introduction of external feedback	d) Using GRIN-rod lenses	: c
398	What is the purpose of wavelength dispersive element is LEC lasers?	a) Wavelength selectivity	b) Reduction of line-width	c) Frequency multiplication	d) Avalanche multiplication	: a
399	An effective method to reduce the line-width is to make the cavity longer. State whether the following statement is true or false.	a) True	b) False			: a

400	Which devices are used to modulate the external cavity in order to achieve the higher switching speeds?	a) Electromagnetic	b) Acousto-optic	c) Dispersive	d) Lead	: b
401	How many techniques are used to tune monolithic integrated devices (lasers)?	a) Five	b) One	c) Two	d) Three	: c
402	_____ laser can be produced when a coupler section is introduced between the amplifier and phase sections of a structure	a) SG-DBR	b) GCSR	c) Y 4-shifted	d) DSM	: b
403	The rare-earth-doped fiber lasers have spectral line-width in the range of _____	a) 0.1 to 1 nm	b) 1.2 to 1.5 nm	c) 6 to 10 nm	d) 2 to 2.3 nm	: a
404	The lasing line-width of Fox-smith resonator is _____	a) Less than 1 MHz	b) 1 MHz	c) 2 MHz	d) Greater than 3 MHz	: a
405	What is the widest tuning range obtained in optical fiber laser structure?	a) 60 nm	b) 80 nm	c) More than 100 nm	d) 100 nm	: c
406	The mechanism which results from a refractive index change in the passive waveguide layer is called as	a) Absorption	b) Spontaneous emission	c) Monolithic inversion	d) Bragg wavelength control	: d
407	How many sections are included in a sampling grating distributed Bragg-reflector laser (SG-DBR)?	a) Four	b) Five	c) Three	d) Two	: b
408	Fiber based lasers provide diffraction-limited power at higher levels than solid-state laser. State whether the given statement is true or false	a) True	b) False			: a
409	The parameters having a major role in determining threshold current of efficiency of injection laser are:	a) Angle recombination and optical losses	b) Frequency chirping	c) Relaxation oscillation	d) Mode hopping	: a
410	Auger current is mostly _____ for material with band gap providing longer wavelength emission.	a) Unaffected	b) Lesser	c) Larger	d) Vanishes	: c
411	Injection lasers operating in smaller wavelengths are subjected to increased carrier losses. State whether the following statement is true or false?	a) True	b) False			: b
412	Devices based on quaternary PbSnSeTe and their ternary compounds, emit at wavelength ?	a) Between 3-4 μm	b) Longer than 4 μm	c) Between 3.5 to 4.2 μm	d) Between 2 to 3 μm	: b
413	Replacing Sn with Eu, Cd or Ge in some _____ the band gap.	a) Remove the band gap	b) Does not affect	c) Decreases	d) Increases	: d
414	Lasing obtained in _____ when 191 mW of pump light at a wavelength of 0.477 μm is launched into laser.	a) Ternary PbSnSeTe alloy laser	b) Quaternary PbSnSeTe alloy laser	c) Doped Fluoro-zirconate fiber	d) Ternary PbEuTe alloy laser	: c

415	The thulium doped fiber laser when pumped with alexandrite laser output at 0.786 μm, the laser emits at	a) 0.6 μm	b) 0.8 μm	c) 2.3 μm	d) 1.2μm	: c
416	The diode-cladding-pumped Erbium praseodymium-doped fluoride device operates at wavelength.	a) Around 3 μm	b) 4 μm	c) 2.6 μm	d) 1.04 μm	: a
417	A technique based on inter-sub band transition is known as	a) Auger recombination	b) Frequency chirping	c) Inter-valence band absorption	d) Quantum cascading	: d
418	In a QC laser, a same electron can emit number of photons. State the given statement is true or false?	a) True	b) False			: a
419	The phenomenon resulting in the electrons to jump from one state to another each time emitting of photon is known as :	a) Inter-valence band absorption	b) Mode hopping	c) Quantum cascading	d) Quantum confinement	: d
420	A QC laser is sometimes referred as:	a) Unipolar laser	b) Bipolar laser	c) Gain guided laser	d) Non semiconductor laser	: a
421	In QC lasers, it is possible to obtain different output signal wavelengths. This can be achieved by	a) Inter-valence band absorption	b) Mode hopping	c) Quantum cascading	d) Selecting layers of different thickness	: d
422	QC lasers _____ the performance characteristics.	a) Have negligible effects	b) Does not affects	c) Improves	d) Degrades	: c
423	An MQW cascaded laser is more advantageous because of:	a) Mode hopping	b) Auger recombination	c) Control over layers of material	d) Properties of material	: c
424	The absence of _____ in LEDs limits the internal quantum efficiency.	a) Proper semiconductor	b) Adequate power supply	c) Optical amplification through stimulated emission	d) Optical amplification through spontaneous emission	: c
425	The excess density of electrons Δnand holes Δpin an LED is	a) Equal	b) Δpmore than Δn	c) Δn more than Δp	d) Does not affects the LED	: a
426	The hole concentration in extrinsic materials is _____ electron concentration.	a) much greater than	b) lesser than	c) equal to	d) negligible difference with	: a
427	In a junction diode, an equilibrium condition occurs when	a) Δngreater than Δp	b) Δnsmaller than Δp	c) Constant current flow	d) Optical amplification through stimulated emission	: c
428	Determine the total carrier recombination lifetime of a double heterojunction LED where the radioactive and nonradioactive recombination lifetime of minority carriers in active region are 70 ns and 100 ns respectively.	a) 41.17 ns	b) 35 ns	c) 40 ns	d) 37.5 ns	: a
429	Determine the internal quantum efficiency generated within a device when it has a radiative recombination lifetime of 80 ns and total carrier recombination lifetime of 40 ns.	a) 20 %	b) 80 %	c) 30 %	d) 40 %	: b

430	Compute power internally generated within a double-heterojunction LED if it has internal quantum efficiency of 64.5 % and drive current of 40 mA with a peak emission wavelength of 0.82 μm.	a) 0.09	b) 0.039	c) 0.04	d) 0.06	: b
431	The Lambertian intensity distribution _____ the external power efficiency by some percent.	a) Reduces	b) Does not affects	c) Increases	d) Have a negligible effect	: a
432	A planar LED fabricated from GaAs has a refractive index of 2.5. Compute the optical power emitted when transmission factor is 0.68.	a) 3.4 %	b) 1.23 %	c) 2.72 %	d) 3.62 %	: c
433	A planar LED is fabricated from GaAs is having a optical power emitted is 0.018% of optical power generated internally which is 0.018% of optical power generated internally which is 0.6 P. Determine external power efficiency.	a) 0.18%	b) 0.32%	c) 0.65%	d) 0.9%	: d
434	For a GaAs LED, the coupling efficiency is 0.05. Compute the optical loss in decibels.	a) 12.3 dB	b) 14 dB	c) 13.01 dB	d) 14.6 dB	: c
435	13. In a GaAs LED, compute the loss relative to internally generated optical power in the fiber when there is small air gap between LED and fiber core. (Fiber coupled = 5.5 * $10^{-4}P_{int}$)	a) 34 dB	b) 32.59 dB	c) 42 dB	d) 33.1 dB	: b
436	Determine coupling efficiency into the fiber when GaAs LED is in close proximity to fiber core having numerical aperture of 0.3	a) 0.9	b) 0.3	c) 0.6	d)0.12	: a
437	If a particular optical power is coupled from an incoherent LED into a low-NA fiber, the device must exhibit very high radiance . State whether the given statement is true or false.	a) True	b) False			: a
438	The amount of radiance in planer type of LED structures is	a) Low	b) High	c) Zero	d) Negligible	: a
439	In optical fiber communication, _____ major types of LED structures are used	a) 2	b) 4	c) 6	d) 3	: c
440	As compared to planar LED structure, Dome LEDs have _____ External power efficiency, _____ effective emission area and_____ radiance.	a) Greater, lesser, reduced	b) Higher, greater, reduced	c) Higher, lesser, increased	d) Greater, greater, increased	: b
441	The techniques by Burros and Dawson in reference to homo structure device is to use an etched well in GaAs structure. Determine the given statement is True or false.	a) True	b) False			: a
442	In surface emitter LEDs, more advantage can be obtained by using	a) BH structures	b) QC structures	c) DH structures	d) Gain-guided structure	: c

443	Internal absorption in DH surface emitter Burros type LEDs is	a) Cannot be determined	b) Negligible	c) High	d) Very low	: d
444	DH surface emitter generally give	a) More coupled optical power	b) Less coupled optical power	c) Low current densities	d) Low radiance emission into-fiber	: a
445	A DH surface emitter LED has an emission area diameter of 60μm. Determine emission area of source	a) $1.534*10^{-6}$	b) $5.423*10^{-3}$	c) $3.564*10^{-2}$	d) $2.826*10^{-9}$	: d
446	Estimate optical power coupled into fiber of DH SLED having emission area of $1.96*10^{-5}$, radiance of 40 W/rcm_2, numerical aperture of 0.2 and Fresnel reflection coefficient of 0.03 at index matched fiber surface.	a) $5.459*10^{-5}$	b) $1.784*10^{-3}$	c) $3.478*10_2$	d) $9.551*10^{-5}$	: d
447	In a multimode fiber, much of light coupled in the fiber from an LED is	a) Increased	b) Reduced	c) Lost	d) Unaffected	: c
448	Determine the overall power conversion efficiency of lens coupled SLED having forward current of 20 mA and forward voltage of 2 V with 170 μWof optical power launched into multimode step index fiber.	a) $1.256*10^{-5}$	b) $4.417*10_2$	c) $4.25*10^{-3}$	d) $2.14*10^{-3}$	: c
449	The overall power conversion efficiency of electrical lens coupled LED is 0.8% and power applied 0.0375 V. Determine optical power launched into fiber	a) 0.03	b) 0.05	c) 0.3	d) 0.01	: a
450	Mesa structured SLEDs are used	a) To reduce radiance	b) To increase radiance	c) To reduce current spreading	d) To increase current spreading	: c
451	The InGaAsP is emitting LEDs are realized in terms of restricted	a) Length strip geometry	b) Radiance	c) Current spreading	d) Coupled optical power	: a
452	The active layer of E-LED is heavily doped with	a) Zn	b) Eu	c) Cu	d) Sn	: a
453	Intrinsically _____ are a very linear device.	a) Injection lasers	b) DH lasers	c) Gain-guided	d) LEDs	: d
454	Linearizing circuit techniques are used for LEDs. State whether the given statement is true or false.	a) True	b) False			: a
455	The internal quantum efficiency of LEDs decreasing _____with _____ temperature.	a) Exponentially, decreasing	b) Exponentially, increasing	c) Linearly, increasing	d) Linearly, decreasing	: b
456	To utilize _____ of SLDs at elevated temperatures, the use of thermoelectric coolers is important.	a) Low-internal efficiency	b) High-internal efficiency	c) High-power potential	d) Low-power potential	: c
457	For particular materials with smaller bandgap energies operating in _____ wavelength, the linewidth tends to _____	a) 2.1 to 2.75 μm, increase	b) 1.1 to 1.7 μm, increase	c) 2.1 to 3.6 μm, decrease	d) 3.5 to 6 μm, decrease	: b

458	The active layer composition must be adjusted if a particular center wavelength is desired.State whether the given statement is true or false.	a) True	b) False			: a	
459	In optical fiber communication, the electrical signal dropping to half its constant value due to modulated portion of optical signal corresponds to _____	a) 6 dB	b) 3 dB	c) 4 dB	d) 5 db	: b	
460	The optical 3 dB point occurs when currents ratio is equal to	a) ⅝	b) ⅔	c) ½	d) ¾	: c	
461	The optical bandwidth is _____ the electrical bandwidth.	a) Smaller	b) Greater	c) Same as	d) Zero with respect to	: b	
462	When a constant d.c. drive current is applied to device, the optical o/p power is 320 μm. Determine optical o/p power when device is modulated at frequency 30 MHz with minority carrier recombination lifetime of LED i.e. 5ns.	a) $4.49*10^{-12}$	b) $6.84*10^{-9}$	c) $1.29*10^{-6}$	d) $2.29*10^{-4}$	: d	
463	The optical power at 20 MHz is 246.2 μW. Determine dc drive current applied to device with carrier recombination lifetime for LED of 6ns.	a) $3.48*10^{-4}$	b) $6.42*10^{-9}$	c) $1.48*10^{-3}$	d) $9.48*10^{-12}$	: a	
464	Determine the 3 dB electrical bandwidth at 3 dB optical bandwidth Bopt of 56.2 MHz.	a) 50.14	b) 28.1	c) 47.6	d) 61.96	: b	
465	The 3 dB electrical bandwidth B is 42 MHz. Determine 3dB optical bandwidth Bopt:	a) 45.18	b) 59.39	c) 78.17	d) 94.14	: b	
466	Determine degradation rate βrif constant junction temperature is 17 degree celsius.	a) $7.79*10^{-11}$	b) $7.91*10^{-11}$	c) $6.86*10^{-11}$	d) $5.86*10^{-11}$	: a	
467	Determine CW operating lifetime for LED with βrt = -0.58 and degradation rate βr= $7.86*10^{-11}$ h^{-1}.	a) 32.12	b) 42	c) 22.72	d) 23.223	: c	