Model Question Paper-1/2 with effect from 2021(CBCS Scheme)

USN

7th Semester B.E. Degree Examination
Subject Title: Optical Communication and Optical Networks

TIME: 03 Hours   **Max. Marks: 100**

Note: 01.   Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	***Bloom's Taxonomy Level**	**COs**	**Marks**
Q.01	a	With relevant diagrams explain types of optical fibers, considering the number of modes and material composition of the core.	L2	01	8
	b	A manufacturing engineer wants to make an optical fiber that has a core index of 1.480 and a cladding index of 1.478. Find the core size for single-mode operation at 1550 mm?	L1	01	4
	c	Explain the different types of fiber materials used for fabrication of optical fiber and their requirements?	L2	01	8
		OR			
Q.02	a	Define what is signal attenuation in optical fiber? Explain different types of absorption losses in optical fibre.	L2	01	8
	b	Consider a 30-km long optical fiber that has an attenuation of 0.4 dB/km at 1310 nm. Determine the optical output power, if 200 μw of optical power is launched into the fiber. Express the output power in dBm units.	L4	01	4
	c	Explain with the neat diagram, types of bending losses in optical fiber.	L2	01	8
		Module-2			
Q. 03	a	Explain the cross section of GaAlAS double hetero (DH) structure LED showing energy band diagram and refractive index profile.	L2	02	10
	b	With relevant diagrams, explain the principles of conversion of optical signal to electrical signal by a PIN photodetector.	L2	02	10
		OR			
Q.04	a	With the help of a schematic diagram, explain the construction and working of Reach-through avalanche photodiode (RAPD).	L2	02	10
	b	Explain in brief operational principle and implementation of WDM network with neat diagram.	L2	02	10
		Module-3			
Q. 05	a	Outline the overview of Public Fiber Network (Terrestrial Network) Architecture with the help of a diagram.	L2	03	8
	b	Define the following parameters w.r.to WDM signal transmission: i) Channel Spacing ii) Power spectrum iii) Bandwidth iv) Spectral efficiency and v) Wavelength standards	L1	03	6
	c	Explain the advantages of Optical Networks.	L2	03	6
		OR			
Q. 06	a	With the help of a diagram, explain WDM wavelength-routing network.	L2	03	8
	b	Distinguish between Circuit Switching and Packet Switching and explain with neat diagram.	L4	03	6
	c	Briefly explain Optical power and loss.	L2	03	6
		Module-4			
Q. 07	a	Explain about WDM a) Transmitter and b) Receiver.	L2	04	10
	b	Explain the benefits of SONET/SDH over PDH with suitable diagram.	L2	04	10
		OR			
Q. 08	a	Explain the Components of WDM link with suitable diagram.	L2	04	10
	b	Explain different Ethernet topologies.	L2	04	10

		Module-5			
Q. 09	a	With neat Block Diagram Explain about wavelength-routing mesh network elements	L2	05	10
	b	Explain different OADM architectures with suitable diagrams.	L2	05	10
		OR			
Q. 10	a	Outline the features of wavelength-routing network architecture.	L2	05	10
	b	Explain the key functions of Optical Cross Connect (OXC) in a large network.	L2	05	10

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.

Model Question Paper-2/2 with effect from 2021(CBCS Scheme)

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Note: 01.   Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	***Bloom's Taxonomy Level**	**COs**	**Marks**
Q.01	a	Explain what is the significance of Numerical Aperture? Derive an expression for Numerical Aperture of the step index optical fiber in terms of refractive indices of core and cladding material of fiber.	L2	1	7
	b	Consider a multimode silica optical fiber that has a core refractive index of 1.480 and a cladding refractive index of 1.460. Find (a) The critical angle at the core–cladding interface; (b) The Numerical aperture (NA) and (c) The acceptance angle in air for the fiber.	L1	1	6
	c	Compare Single mode and multimode step index and Graded index optical fiber with diagram.	L4	1	7
		OR			
Q.02	a	Outline various attenuation mechanisms in an optical fibre.	L2	1	8
	b	Consider a graded-index multimode fiber for which the index profile $\propto = 2$, the core index $n_1 = 1.48$ the core- cladding index difference $\Delta = 0.01$ and the core radius of $25\mu m$. If the radius of curvature of the fiber is R = 1.0 cm, what percentage of the modes remain in the fiber at a 1300-nm wavelength?	L1	1	4
	c	Explain with neat waveforms, the Signal Dispersion Mechanism within the optical fiber.	L2	1	8
		Module-2			
Q. 03	a	With the help of schematic diagrams, explain the design features of an edge emitting LED.	L2	2	6
	b	Explain with neat diagram the working of polarization – independent isolator.	L2	2	8
	c	A double-heterojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination times of 30 and 100 ns, respectively. The drive current is 40 mA. Determine (a) The bulk recombination time; (b) The internal quantum efficiency; and (c) The internal power level.	L4	2	6
		OR			
Q.04	a	Derive the expression for internally generated power and efficiency in a LED.	L3	2	8
	b	Define the terms i) spontaneous emission ii) stimulated emission iii) quantum efficiency.	L1	2	6
	c	Define non-reciprocal components. Explain the operational concept of a three-port circulator with relevant diagram.	L2	2	6
		Module-3			
Q. 05	a	With the help of a neat diagram, explain different multiplexing techniques for increasing the transmission capacity on an optical fiber.	L2	3	8
	b	Summarize the wavelength standards of WDM system.	L2	3	6
	c	Explain two fundamental services offered by carriers to the customers with type of Multiplexing used.	L2	3	6
		OR			
Q. 06	a	Explain about second generation optical network.	L2	3	10
	b	Explain the evolution of optical fiber transmission system with suitable diagram.	L2	3	10

		Module-4			
Q. 07	a	Explain the frame structure of Ethernet.	L2	4	10
	b	Explain the features of Optical Transport Network.	L2	4	10
		OR			
Q. 08	a	Briefly explain about the WDM link transmitter using suitable mathematical equations.	L2	4	8
	b	With the help of a diagram, explain the layers of SONET/SDH.	L2	4	6
	c	Explain the layers of Optical Transport Network (OTN) hierarchy.	L2	4	6
		Module-5			
Q. 09	a	With the help of a neat diagram explain the three functional elements of Optical line terminal (OLT).	L2	5	10
	b	Explain the role of Optical Add/Drop Multiplexer (OADM)With three-node linear network example.	L2	5	10
		OR			
Q. 10	a	With Block Diagram Explain about wavelength-routing mesh network elements.	L2	5	10
	b	With the help of block diagram explain the use of an Optical Line Amplifier in Optical Fiber link.	L2	5	10

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