Question Paper Code | **14248**

M.E. / M.Tech. /. - DEGREE EXAMINATIONS, NOV / DEC 2025
First Semester
M.E. - Communication Systems
24PCOPC103 - OPTICAL NETWORKS
Regulations - 2024

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	Optical power is usually measured in:	1	K1	CO1
	(a) Watts　　(b) dB　　(c) dBm　　(d) mW			
2.	The main function of an optical isolator is to:	1	K1	CO2
	(a) Split the signal　　　(b) Amplify the signal			
	(c) Block back reflections　　(d) Convert wavelength			
3.	The main source of crosstalk in optical systems is:	1	K1	CO3
	(a) Multiplexing　(b) Fiber dispersion　(c) Channel interference　(d) Amplifier noise			
4.	MPLS stands for:	1	K1	CO3
	(a) Multi Packet Label Switching　　(b) Multi-Protocol Label Switching			
	(c) Multi Path Label System　　(d) Multiple Packet Layer System			
5.	The basic frame duration in SONET is:	1	K1	CO4
	(a) 100 μs　　(b) 125 μs　　(c) 150 μs　　(d) 1 ms			
6.	The digital wrapper is used in OTN to:	1	K1	CO4
	(a) Increase wavelength spacing			
	(b) Provide performance monitoring and management			
	(c) Add noise			
	(d) Amplify signals			
7.	EDFA operates efficiently around the wavelength	1	K1	CO5
	(a) 850 nm　　(b) 980 nm　　(c) 1310 nm　　(d) 1550 nm			
8.	DWDM allows multiple signals to:	1	K1	CO5
	(a) Travel on different fibers　　(b) Share the same fiber using different wavelengths			
	(c) Use the same wavelength　　(d) Use electrical multiplexing			
9.	BLSR stands for:	1	K1	CO6
	(a) Bidirectional Link Switching Ring　　(b) Basic Line Switching Ring			
	(c) Bidirectional Line-Switched Ring　　(d) Binary Line Switching Route			
10.	The main advantage of MPLS in optical networks is:	1	K1	CO6
	(a) Signal amplification　　(b) Fast label-based routing			
	(c) Noise reduction　　(d) Error correction			

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K – Level	CO
11.	How do nonlinear effects such as self-phase and cross-phase modulation influence signal quality in optical fibers?	2	K1	CO1
12.	Differences between circuit switching and packet switching.	2	K2	CO1
13.	Name three types of optical components used for filtering and routing signals.	2	K1	CO2
14.	State the relationship exists between wavelength, frequency, and channel spacing in optical communication.	2	K1	CO2
15.	How does dispersion create limitations in long-distance optical transmission?	2	K1	CO3
16.	Recall the connection can be made between MPLS and optical cross-connect tables in network operation.	2	K1	CO3
17.	In what way concatenation improves SONET/SDH flexibility.	2	K1	CO4

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **14248**

18.	Compare OTN layered model and SONET hierarchy.	*2*	*K2* *CO4*
19.	List out the role of Add-Drop Multiplexers in a WDM system.	*2*	*K1* *CO5*
20.	Illustrate the importance of the wavelength continuity property in WDM networks.	*2*	*K2* *CO5*
21.	How does line protection differ from path protection in maintaining network reliability?	*2*	*K2* *CO6*
22.	Show how label swapping is used for traffic forwarding in MPLS optical networks.	*2*	*K2* *CO6*

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Explain the concept of channel spacing and wavelength standards, and interpret the impact of optical power and loss on network performance. *11 K2 CO1*

OR

b) Illustrate an optimized architecture for a next-generation optical packet-switched network. Justify your design with reference to scalability, component selection, and loss management. *11 K2 CO1*

24. a) Explain block-level design for an optical communication system using multiplexers and optical amplifiers. *11 K2 CO2*

OR

b) Interpret the impact of major nonlinear effects on the design and performance of high-capacity optical systems. *11 K2 CO2*

25. a) Outline the critical system design considerations such as power penalty, crosstalk, and dispersion management. *11 K2 CO3*

OR

b) Summarize the challenges and benefits associated with the migration from traditional network architectures to IP over Optical Networking. *11 K2 CO3*

26. a) Explain SONET/SDH multiplexing hierarchy for a regional network. Show how frame structure and functional components enable data integrity. *11 K2 CO4*

OR

b) Design a complete OTN layered model for a global data service provider. Show how GFP contributes to interoperability with legacy systems. *11 K2 CO4*

27. a) Describe a DWDM link with 16 channels using EDFAs. Calculate suitable wavelength spacing and discuss dispersion management techniques. *11 K2 CO5*

OR

b) Explain how add-drop multiplexers and tunable lasers contribute to channel flexibility and signal routing in DWDM networks. *11 K2 CO5*

28. a) Compare the different protection schemes used in various optical network topologies and infer the robustness and switching mechanisms of BLSR. *11 K2 CO6*

OR

b) How label switching differs from IP forwarding? Also explain the point-to-point network topology. *11 K2 CO6*