Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 09- 12-2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B. Tech	
Course Code: ECE3061	**Course Name:** Optical Communication	
Semester : VII	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**12**	**14**	**24**	**26**	**17**	**07**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	List any two commonly used wireless access techniques employed in optical communication system.	**2 Marks**	**L1**	**CO1**
2.	Mention two advantages of OWC over RF communication.	**2 Marks**	**L1**	**CO2**
3.	What are the safety concerns related to OWC?	**2 Marks**	**L2**	**CO2**
4.	What is meant by luminous efficiency in an LED?	**2 Marks**	**L2**	**CO3**
5.	Differentiate between PIN and APD photodetectors.	**2 Marks**	**L2**	**CO3**
6.	What is the basic difference between On–Off Keying (OOK) and Pulse Position Modulation (PPM)?	**2 Marks**	**L1**	**CO4**
7.	What is the need for Multi-Carrier Modulation (MCM) in OWC systems?	**2 Marks**	**L2**	**CO4**
8.	List any two advantages of OFDM in Optical Wireless Communication.	**2 Marks**	**L1**	**CO4**
9.	List two factors that affect the Signal-to-Noise Ratio (SNR) in a VLC system.	**2 Marks**	**L1**	**CO5**
10.	Mention any two limitations of underwater optical wireless communication.	**2 Marks**	**L1**	**CO6**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	A university plans to upgrade its wireless network. The team is considering Optical Wireless Communication (Li-Fi) and Radio Frequency (Wi-Fi) technologies. Compare both in terms of bandwidth, security, and interference, and recommend which is more suitable for indoor applications using a table or brief justification.	**10 Marks**	**L4**	**CO1**
	b.	Discuss design fundamentals and safety considerations in OWC systems. Include key optoelectronic component selection criteria and relevant international safety standards.	**10 Marks**	**L3**	**CO2**
		Or			
12.	**a.**	Explain various wireless access schemes such as xDSL, RF, Cable, FTTH, Satellite, and OWC. Compare them based on data rate, coverage, and application areas	**10 Marks**	**L3**	**CO1**
	b.	Explain different link configurations used in OWC systems directed LOS, non-directed LOS, and diffuse links with neat sketches and suitable examples.	**10 Marks**	**L2**	**CO2**

13.	**a.**	Explain the structure and operation of Planar and Edge-Emitting LEDs with neat diagrams. Discuss their comparative advantages in Optical Wireless Communication systems.	**10 Marks**	**L2**	**CO3**
	b.	Describe the working principles of PIN and APD photodetectors with neat diagrams. Compare their performance parameters such as responsivity, gain, and response time in optical communication systems.	**10 Marks**	**L2**	**CO3**
		Or			
14.	**a.**	An LED operating at a wavelength of 870 nm emits an optical power of 4 mW when driven with a forward current of 25 mA. The radiative recombination rate constitutes 70% of the total carrier recombination, and only 55% of the internally generated photons are able to escape the semiconductor material Calculate a. Internal Quantum Efficiency ($\boldsymbol{\eta_{int}}$) and External Quantum Efficiency ($\boldsymbol{\eta_{ext}}$). b. Determine the number of photons emitted per second c. If the injection current is doubled, discuss qualitatively how η_{int} and η_{ext} might change and why. (Given: h = 6.626×10^{-34} J·s, c = 3×10^{8} m/s, e = 1.6×10^{-19} C)	**10 Marks**	**L4**	**CO3**

	b.	Compare power efficiency, luminous efficiency, and modulation bandwidth for LEDs and LASERs.	**10 Marks**	**L3**	**CO3**

15.	**a.**	Explain the working and waveform of PPM and OOK modulation schemes with performance comparison in terms of BER and power efficiency.	**10 Marks**	**L3**	**CO4**
	b.	Describe the concept of Multi-Carrier Modulation (MCM) and explain how OFDM is implemented in OWC systems.	**10 Marks**	**L4**	**CO4**
Or					
16.	**a.**	Discuss the need for NOMA (Non-Orthogonal Multiple Access) in modern OWC systems. Describe the power domain NOMA with a suitable example.	**10 Marks**	**L3**	**CO4**
	b.	Explain the operating principles of digital baseband modulation techniques used in Optical Wireless Communication (OWC). Also discuss the key factors that influence the selection of an appropriate modulation scheme for an OWC system.	**10 Marks**	**L3**	**CO4**

17.	**a.**	Explain the system model of a visible light communication (VLC) system with a neat block diagram. Describe the function of each block and discuss major design considerations.	**15 Marks**	**L3**	**CO5**
	b.	Discuss any two current research trends and future challenges in VLC or Li-Fi systems. Suggest one method to improve data rate or coverage.	**5 Marks**	**L3**	**CO6**
Or					
18.	**a.**	A team is designing an Underwater Optical Wireless Communication (UOWC) system to transmit sensor data from coral reefs to a surface buoy. Analyze the system performance for clear, coastal, and turbid water. List the key limitations, design considerations, and techniques (e.g., modulation or coding) to improve reliability and data rate.	**15 Marks**	**L4**	**CO5**
	b.	Explain the application of VLC in Vehicle-to-Vehicle (V2V) communication. Mention two advantages of using VLC over traditional RF-based V2V systems**.**	**5 Marks**	**L3**	**CO6**