Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B.Tech. (ECE)	
Course Code: ECE3022	**Course Name:** Fundamentals of Photonics	
Semester: V	**Max Marks**: 50	**Weightage:** 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**26**	**24**			

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. **5Q x 2M=10M**

1	What is Huygen's hypothesis on the nature of light.	**2 Marks**	**L1**	**CO1**
2	What is the difference between Fresnel and Fraunhofer diffraction?	**2 Marks**	**L1**	**CO1**
3	List the active and passive components in photonic integrated circuits.	**2 Marks**	**L1**	**CO1**
4	Write the wave equation for a simple travelling wave propagating along the z-direction.	**2 Marks**	**L1**	**CO2**
5	Define acceptance angle.	**2 Marks**	**L1**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	With neat diagrams, explain the diffraction and interference as per the wave optics. (You do not have to derive expressions related to diffraction and interference)	**10 Marks**	**L2**	**CO1**
	b.	A ray of light is travelling from one medium to another medium. The speed of light in the first medium and the second medium is 2×10^8 m/s and 2.3×10^8 m/s respectively. The speed of light in free space is 3×10^8 m/s. (i) If the light is incident on the interface at an angle 60°, calculate the angle of reflection and the angle of refraction at the interface. (ii) If the angle of refraction if 90°, calculate the minimum angle of incidence.	**10 Marks**	**L3**	**CO1**
		Or			
7.	**a.**	Explain the advantages of optical detectors. Also, describe the three types of optical detectors.	**10 Marks**	**L2**	**CO1**
	b.	Two slits are placed 0.2mm apart. The slits are kept at 1.2m from the screen. The slits are illuminated with a light of 620nm. (i) Calculate the width of the central bright fringe? (ii) Calculate the distance between the second and third dark fringe?	**10 Marks**	**L3**	**CO1**

8.	**a.**	With neat diagrams, explain all five types of non-planar waveguides.	**10 Marks**	**L2**	**CO2**
	b.	A waveguide with a core of refractive index 1.5 is enclosed in a cladding to ensure total internal reflection. The light is incident on the core from air medium at an angle 45°. (i) Calculate the angle at which the light is incident on the core-cladding interface. (ii) Calculate the refractive index of the cladding to ensure total internal reflection.	**10 Marks**	**L3**	**CO2**
		Or			
9.	**a.**	Define guided mode of a waveguide. Describe the total resonance condition that must be satisfied to achieve guided mode.	**10 Marks**	**L2**	**CO2**

	b.	The acceptance angle of a waveguide in 40° when kept in water medium with refractive index 1.33. If the same waveguide is kept in 70% ethanol with refractive index 1.36, (i) Calculate the acceptance angle of the waveguide in 70% ethanol (ii) Calculate the numerical aperture of the waveguide in both the medium.	**10 Marks**	**L3**	**CO2**