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***B.Tech. Degree I Semester Regular/Supplementary Examination in  
Marine Engineering December 2024***

**19-208-0102 ENGINEERING PHYSICS  
(2019 Scheme) .**

Time: 3 Hours

Maximum Marks: 60

## Course Outcome

On successful completion of the course, the students will be able to:

- CO1: Understand interference of light and its applications and applications of X- rays.  
 CO2: Grasp the basics of diffraction and their applications.  
 CO3: Understand many modern devices and technologies based on lasers and sound recording.  
 CO4: Have a fundamental knowledge of fiber optics and their applications.  
 CO5: Have an understanding of different marine equipment the characteristics and applications and superconducting materials.

Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze, L5 – Evaluate,  
 L6 – Create

PI – Programme Indicators

(Answer *ALL* questions)

(5 × 15 = 75)

	Marks	BL	CO	PI
I. (a) What is anti-reflection coating? Explain its principle and application.	3	L2	1	1.2.1
(b) Derive an expression for wavelength of light in Newtons ring experiment.	8	L4	1	2.3.1
(c) A photon is Compton scattered by a free electron at rest through an angle of 90°. What is the energy of the scattered photon, if the energy of the incident photon is 10 MeV?	4	L5	1	1.2.1
<b>OR</b>				
II. (a) How will you find the thickness of a thin wire using air wedge method?	3	L2	1	1.2.1
(b) What are characteristic x-rays? Give its origin. Explain Moseley's law of characteristic x-rays.	8	L4	1	2.3.1
(c) A soap film of 5000 Å thickness is viewed at an angle of 35° to the normal. Find the wave lengths in the visible light which will be absent in the reflected light. The refractive index of the film is 1.333.	4	L5	1	1.2.1
III. (a) What is dispersive power of a grating? Derive an equation for dispersive power.	3	L1	2	1.2.1
(b) Explain the production and detection of different types of polarized light.	8	L3	2	2.3.1
(c) A transmission grating has 8000 rulings per cm. The first order principal maximum due to a monochromatic source of light occurs at an angle of 30°. Determine the wave length of light.	4	L5	2	1.2.1
<b>OR</b>				
IV. (a) Using Rayleigh criterion of resolution, obtain an equation for the resolving power of a telescope.	3	L1	2	1.2.1
(b) Describe the construction and action of a zone plate. Derive an expression for its focal length.	8	L3	2	2.3.1
(c) A half wave plate is fabricated for a wavelength of 3800 Å. For what wavelength does it work as a quarter wave plate.	4	L5	2	1.2.1

(P.T.O.)

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		Marks	BL	CO	PI
V.	(a) Write a note on production, properties and application of electro-magnetic waves.	3	L3	3	1.2.1
	(b) Explain the construction and working of He-Ne laser with the help of energy level diagram.	8	L2	3	2.3.1
	(c) A 10 mw laser has a beam diameter of 1.6 mm. What is the intensity of light, assuming that it is uniform across the beam?	4	L5	3	1.2.1
<b>OR</b>					
VI.	(a) Explain spontaneous and stimulated emission of radiation.	3	L2	3	1.2.1
	(b) Write a note on the recording and reproduction of sound using magnetic tape.	8	L3	3	1.2.1
	(c) A typical He-Ne laser emits radiation of wave length 6328 Å°. How many photons per second would be emitted by a one milliwatt He-Ne laser?	4	L5	3	1.2.1
VII.	(a) What is meant by critical propagation angle of an optical fibre? Obtain an expression for the critical propagation angle.	3	L3	4	1.2.1
	(b) Give the block diagram of optical fibre communication system explaining the functions of different blocks. Compare its merits over conventional communication system.	8	L3	4	2.3.1
	(c) An optical fibre has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Find the acceptance angle for the fibre in water, which has a refractive index of 1.33.	4	L5	4	1.2.1
<b>OR</b>					
VIII.	(a) Explain the principle of optic fibre communication. Mention advantages of fibre optic communication.	3	L2	4	1.2.1
	(b) Derive an expression for angle of acceptance and numerical aperture of fibre in terms of refractive index of core and cladding of an optical fibre.	8	L2	4	2.3.1
	(c) Consider a fibre having a core of index 1.48, a cladding of index 1.46 and has a core diameter 30 mm. Show that all rays making an angle less than $9.43^\circ$ with the axis will propagate through the fibre.	4	L5	4	1.2.1
IX.	(a) What is the principle of gyrocompass?	3	L2	5	1.2.1
	(b) Explain the phenomenon of magnetostriction. How is high frequency sound waves produced with it?	8	L1	5	1.2.1
	(c) Give a short account of high temperature superconductivity.	4	L3	5	2.3.1
<b>OR</b>					
X.	(a) Explain Meissner effect and isotope effect.	3	L1	5	1.2.1
	(b) Describe the principle and working of SQUID.	8	L2	5	2.3.1
	(c) Describe ultrasonic flaw detector. How it is used in detection of flaws in metals?	4	L3	5	1.2.1

Bloom's Taxonomy Level

L1 – 11.33%, L2 – 26%, L3 – 30.67%, L4 – 10.67%, L5 – 21.33%.

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