

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), May 2019
B. Tech (Branch: Common to all discipline), Semester II

Roll No.....

PH101: Engineering Physics

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Mobiles are not allowed during examination.
5. Non-programmable calculator is allowed.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Dark ring in a Newton's ring set-up obey the relation
(a) $D_n \propto \sqrt{n}$ (b) $D_n \propto \sqrt{(2n-2)}$ (c) $D_n \propto \sqrt{2n}$ (d) $D_n \propto \sqrt{(2n-1)}$
- ii. When white light is incident on a thin film of oil or soap bubble, then multiple colours appear due to _____ of light.
(a) interference (b) diffraction (c) polarization (d) none
- iii. In Fraunhofer class of diffraction, the source of light and screen are at _____ distance from the diffracting aperture or obstacle
(a) finite (b) infinite (c) large (d) any
- iv. The diffraction fringes obtained by a single slit are of _____.
(a) unequal width and equal intensity (b) equal width and unequal intensity
(c) equal width and equal intensity (d) unequal width and unequal intensity
- v. Polaroid sun glasses decreases the glare on a sunny day because they
(a) block a portion of sun light (b) have a special colour
(c) completely absorb the sun light (d) refract the light
- vi. Snell's law is obeyed by
(a) e-ray (b) o-ray (c) both e-ray and o-ray (d) neither e-ray and o-ray
- vii. For step index optical fibres, the refractive index of core is _____.
(a) constant (b) varies as $1/r$ (c) varies as $1/r^2$ (d) varies as r

viii. Examples for _____ emission light are glowing tube light, electric bulb, candle flame, etc.

- (a) stimulated (b) spontaneous (c) both a & b (d) none

ix. The de-Broglie wavelength of a moving electron is given by

- (a) $\lambda = \frac{12.27}{\sqrt{mkT}} \text{ \AA}$ (b) $\lambda = \frac{6}{\sqrt{3mkT}} \text{ \AA}$ (c) $\lambda = \frac{12.27}{\sqrt{V}} \text{ \AA}$ (d) $\lambda = \frac{10.89}{\sqrt{V}} \text{ \AA}$

x. To be a solution of the Schrodinger equation, the wave function should be multivalued, continuous, and continuous first derivatives. [YES/NO]

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- Prove that only first order is possible if the width of a grating element is less than twice the wavelength of light.
- Discuss the various characteristics of ordinary and extraordinary rays.
- Discuss the dual nature of material and waves. Derive an expression for the de Broglie wavelength.
- What are the assumptions made by Planck for blackbody radiations?

Q.3A Explain the conditioned which are required to a thin film for working as anti-reflection coatings. What are the applications of the antireflection coatings? 05

Q.3B Newton's rings are obtained by a source emitting $\lambda_1 = 6000 \text{ \AA}$ and $\lambda_2 = 4500 \text{ \AA}$. If n^{th} ring of λ_1 coincides with $(n+1)^{\text{th}}$ ring of λ_2 find diameter of the n^{th} ring of wavelength λ_1 . The radius of curvature of the curved surface is 90 cm. 05

Q.4A Differentiate the function of step index and graded index optical fibre? 05
Determine numerical aperture of a step index optical fibre.

Q.4B Find the core diameter necessary for single mode operation at wavelength 850 nm in SI fibre with $n_1 = 1.480$ and $n_2 = 1.470$. What is its numerical aperture and maximum angle of acceptance of this fibre. 05

Q.5A Discuss (a) What particular spectra would be absent if the width of the transparencies and opacities of the grating are equal? (b) Dispersive power of a grating. 05

Q.5B A plane transmission grating has 6000 lines/cm. Calculate the longest wavelength of light for which spectrum can be obtained. 05

Q.6A Define optical activity and specific rotation. How will you measure specific 05

rotation of glucose solution using Laurent's half shade device?

- Q.6B A 2.2 dm long tube and containing 48 cm^3 of sugar solution produces an optical rotation of 11° when placed in a polarimeter. If the specific rotation of sugar solution is 66° , calculate the quantity of sugar contained in the tube in the form of a solution. 05

OR

- Q.6B If 20 cm length of a certain solution causes right handed rotation of 32° and 30 cm length of another solution causes left handed rotation of 18° . What optical rotation will be caused by 30 cm length of a mixture of the above solutions in the volume ratio 1 : 2. The solutions are not chemically active. 05

- Q.7A What is quarter wave plate? Explain its use in getting circularly and elliptically polarized light. 05

- Q.7B Light from quasi monochromatic sodium lamp of intensity I_0 falls on two polaroids oriented at the angle of 30° . Find the intensity of light passing out of the polarizers. 05

OR

- Q.7B The optic axis of a quartz crystal is parallel to its faces. What is the thinnest possible plate that would serve to put the ordinary and extraordinary rays of $\lambda = 589 \text{ nm}$ a half-wave apart on their exit? 05

- Q.8 Describe Fraunhofer diffraction due to a single slit and derive the expression of intensity of the spectral lines on the screen. Show that intensities of first and second maxima are $\frac{1}{22}$ and $\frac{1}{61}$ of the intensity of the central maxima. 10

- Q.9A Describe the formation of dark and bright circular fringes by reflected monochromatic light in the Newton's rings experiment. Discuss how these rings can be used to determine the refractive index of the medium. 10

- Q.9B What are essential requirements to produce a laser? How are these fulfilled in a He-Ne laser? Describe the working of He-Ne laser? 10

OR

- Q.9B What is physical significance of wave function? Solve Schrodinger equation for a free particle in one dimensional box and find eigen values and eigen functions for a free particle. 10

