

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), December 2018
B. Tech (Branch: Common to all discipline), Semester I

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.	During the interference of light, energy is... (a) created at the maxima (b) destroyed at the minima (c) not conserved (d) redistributed	
iii.	Maximum number of orders available with a grating is _____. (a) independent of the grating element (b) directly proportional to the grating element (c) inversely proportional to the grating element (d) directly proportional to the wavelength	
iv.	In diffraction fringes, the central maximum is (a) equal in width to that of other fringes (b) half the width of other fringes (c) twice the width of other fringes (d) thrice the width of other fringes	
v.	Sunglasses having the polarizing film can reduce the glare and dazzle. [Yes/No]	
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.	Light travelling in a graded index optical fibre follows a (a) helical path (b) circular path (c) zigzag path (d) straight-line path	

viii.	The correct choice for fabricating LED is_____	
	(a) Si (b) Ge (c) GaAs (d) Carbon	
ix.	De-Broglie wavelength is independent of	
	(a) mass (b) velocity (c) charge (d) all of these	
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
i.	Define coherent sources. Discuss why two independent sources of light of same wavelength can't show interference?	
ii.	Explain double refraction phenomenon?	
iii.	What particular spectra would be absent if the width of the transparencies and opacities of the grating are equal?	
iv.	Discuss the dual nature of material and waves. Derive an expression for the de Broglie wavelength.	
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	A laser operates at wavelength of $6200 \text{ \AA}$ and its spectral line width $\Delta\nu$ is 10^2 Hz . For this calculate (i) coherent length (ii) Spectral purity factor	05
Q.4A	Differentiate the function of step index and graded index optical fibre? Show that numerical aperture of a step index optical fibre is given by $NA = n_1 \sqrt{2\Delta}$ Where symbols have their usual meanings.	05
Q.4B	Find the core diameter necessary for single mode operation at 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. Given $V = 2.405$.	05
Q.5A	Find an expression for (a) the angular half-width of the principal maxima of a grating (b) Dispersive power of a grating.	05
Q.5B	Find the lowest energy of an electron confined to move in one-dimentional box of length $1 \text{ \AA}$.	05
Q.6A	What is quarter wave plate? Explain its use in analyzing circularly and	05

	elliptically polarized light.	
Q.6B	80 gm of impure sugar when dissolved in one liter water gives an optical rotation of 9.9° , when placed in a tube of length 200mm. If the specific rotation of sugar is 66° , find the percentage purity of sugar sample.	05
	OR	
Q.6B	Two polarized sheets have their direction parallel so that the intensity of transmitted light is maximum. Through what angle must either sheet be turned so that the intensity becomes one half of the initial value?	05
Q.7A	Explain Malus law taking in to account the transmission of polarized and unpolarised light through a Nicol Prism.	05
Q.7B	A diffraction grating has total ruled width 5 cm. for normal incidence; it is found that a line of wavelength $6500 \text{ \AA}$ in a certain order superimpose on other line of wavelength $4300 \text{ \AA}$ of the next order. If the angle of diffraction is 30° , how many lines are there on grating?	05
	OR	
Q.7B	The distance between the second and fifth minimum in diffraction pattern due to single slit is 0.4 mm. The screen is 60 cm away from the slit. If wavelength of light used is $6000 \text{ \AA}$, determine width of the slit.	05
Q.8	Discuss the degeneracy of the energy states. Solve Schrodinger equation for a free particle in three dimensional box and find eigen values and eigen functions for a free particle.	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 wavelength of sodium light. Show that width of successive Newton's rings goes on decreasing.	10
Q.9B	What do you understand by spontaneous emission and stimulated emission? What are essential requirements to produce a laser? Describe the working of He-Ne laser?	10
	OR	
Q.9B	Describe Fraunhofer diffraction due to a single slit and derive the expression of intensity of the spectral lines on the screen. Show that the intensity of first secondary maxima in the diffraction pattern of single slit is approximately equal to 4.5% of the central maximum.	10