

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), November 2016

B. Tech./B. Tech+M. Tech (Branch: CSE, ECE, EE), 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.	When a drop of oil is spread on a water surface, it displays beautiful colours in daylight because of _____. (a) interference (b) diffraction (c) polarization (d) none	
ii.	Spatial coherence represents the relation between waves (a) at same time only (b) at same place only (c) at different place and same time (d) at same place and different time	
iii.	A diffraction pattern is obtained using a beam of red light. If the red light is replaced by a blue light, then (a) the diffraction pattern remain unchanged (b) diffraction bands become narrow and crowded together (c) bands become broader and farther apart (d) bands disappear	
iv.	In Fraunhofer diffraction, the incident and diffracted wavefronts can be considered..... (a) spherical (b) plane (c) elliptical (d) circular	
v.	A quarter wave plate converts plane polarized light into (a) linearly polarized light (b) circularly polarized light (c) elliptically polarized light (d) none	

vi.	Polarization of light proves the_____.	
	(a) corpuscular nature of light (b) quantum nature of light	
	(c) transverse nature of light (d) longitudinal nature of light	
vii.	Optical Fibre communication uses carrier wave as	
	(a) radio wave (b) laser wave (c) ordinary wave (d) microwaves	
viii.	The correct choice for fabricating LED is_____	
	(a) Si (b) Ge (c) GaAs (d) Carbon	
ix.	Hamiltonian operator defines the _____	
	(a) total energy of the system (b) potential energy of the system	
	(c) kinetic energy of the system (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.	Explain why the excessively thin films seen by reflected light appears dark.	
ii.	Under what situations are certain orders in spectra of optical gratings missing?	
iii.	What is V-number in optical communication through optical fibre?	
iv.	Show that the phase velocity of the de Broglie wave is greater than the velocity of light, but the group velocity is equal to the velocity of the particle with which the wave are associated.	
Q.3A	Discuss how thin coating films can be used as anti-reflection coatings. Determine the refractive index and thickness of the film working as reflection resistant layer.	05
Q.3B	The Doppler line width for an orange line of Krypton is 550×10^{-15} m. if the wavelength of light is 605.8 nm, calculate the coherent length.	05
Q.4A	Describe the functioning of single mode step index and multimode graded index optical fibres with ray paths. Determine the maximum angle of acceptance of an optical fibre.	05
Q.4B	A small object of mass 1 mg is confined to move between two rigid walls separated by 1 cm. Calculate (a) Its zero point energy i.e. lowest allowed energy.	05

	How the result is in contradiction to the classical view point? (b) Minimum speed of the object.	
Q.5A	An X-ray photon of wavelength $0.4 \text{ \AA}$ is scattered through an angle of 45° by a free electron. Find the wavelength of the scattered photon and recoil energy of the electron.	05
Q.5B	Define the degeneracy of an energy level. One of the energy levels for a particle of mass m confined in a cubical box of side L has the energy $E = \frac{7\pi^2\hbar^2}{mL^2}$. Find the degeneracy of this energy level.	05
Q.6A	What is quarter wave plate? Explain its use in getting circularly and elliptically polarized light.	05
Q.6B	Two crossed polaroids A and B are placed in a path of light beam. In between these a third polaroid C is placed whose plane of transmission makes an angle 45° with the plane of transmission of the polaroid A. If the intensity of unpolarized light incident on polaroid A is 40 W/m^2 , then what will be the intensity of light emerging from the polaroid B?	05
OR		
Q.6B	If 20 cm length of a certain solution causes left handed rotation of 320 and 30 cm length of another solution causes right handed rotation of 180 . What optical rotation will be caused by 30 cm length of a mixture of the above solutions in the volume ratio $2 : 1$. The solutions are not chemically active.	05
Q.7A	What is the plane transmission grating? Explain qualitatively how it produces spectrum of composite light. Explain how angular width of principle maxima can be determined by a plane transmission grating.	05
Q.7B	Two grating A and B have the same width of the ruled surface but A has greater number of lines. Giving reasons, compare the following (a) Intensity (b) Width of principal maxima (c) Dispersive power of grating	05
OR		
Q.7B	In Fraunhofer diffraction due to a narrow slit, a screen is placed 3 m away from the lens to obtain the pattern. If the slit width is 0.3 mm and the first minima lie 4 mm on either side of the central maximum, find the wavelength of light.	05

Q.8 Write down the Schrodinger's equation for a free particle enclosed in one dimensional box of size 'a'. Solve it for eigen values and eigen functions. Find lowest energy of the non-degenerate state. 10

Q.9A Describe with schematic diagram the formation of dark and bright circular fringes by reflected monochromatic light in the Newton's rings experiment. Prove that center of the dark rings are proportional to square root of the natural number. Discuss those conditions for which center of the ring are dark and bright. 10

Q.9B What do you mean by population inversion? Explain how it is achieved in semiconductor laser. What are different types and applications of semiconductor laser? 10

OR

Q.9B Define specific rotation. Explain the working of half shade device. How will you determine specific rotation using half shade polarimeter? 10