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NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA
THEORY EXAMINATION

Question Paper

Month and year of the examination: Nov/Dec, 2018
Programme: B.Tech   Semester.........First
Subject...Physics-I   Course No. PHIR11
Maximum Marks......50   No. of Questions to be Attempted............05
Time Allowed............3 Hrs   Total No. of Questions...............08
Total No of pages used...................02

Unless stated otherwise, the symbols have their usual meanings in context with the subject. Assume suitably and state, additional data required, if any.

The Candidates, before starting to write the solutions, should please check the Question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course no. and right subject title.

Note: Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory.

	Compulsory Question	
1.	(a) What is the significance of wave function and probability density? [2]	
	(b) Write any four properties of electromagnetic waves. [2]	
	(c) Differentiate between step index and graded index fibres. [2]	
	(d) Distinguish between interference and diffraction. [2]	
	(e) Explain lattice, basis and crystal structure? How are they related? [2]	

UNIT-I

2. (a) Solve the Schrodinger equation for a particle of mass 'm' confined in a one – dimensional potential well of the form

$$V = 0 \quad \text{when} \quad 0 \leq x \leq L$$
$$V = \infty \text{ when } \quad 0< x, x > L$$

Obtain the discrete energy values and the normalized eigen functions.   [7]

(b) Calcualte the De-Broglie wavelength of an α-particle accelerated through a potential difference of 200 volts. [3]

3. (a) State and explain Heisenberg uncertainty principle. Use this to show that electron cannot exist in atomic nucleus. [6]

(b) Write Maxwell's equations and give their physical significance. [4]

UNIT-II

4. Discuss the significance of E-K diagram. Explain the concept of effective mass. How does it depend upon E-K Curve? [4+3+3 = 10]

5. (a) Explain Hall effect. What information does Hall effect measurement provide about the solid? [6]

(b) What are the salient features of Miller indices? [4]

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6. (a) Describe Michelson- Morley Experiment and discuss its negative results. [7]

(b) Show that the quantity $x^2 + y^2 + z^2 - c^2 t^2$ is invariant under Lorentz transformation. [3]

7. (a) Explain the interaction of charged particles with matter. [5]
(b) Distinguish between nuclear fission and nuclear fusion process. Explain the function of the moderator in nuclear reactor. [5]

UNIT-IV

8. (a) Describe principle, construction and working of He-Ne laser with energy level diagram. [5]
(b) Explain the following terms:
(i) Stimulated emission (ii) Population inversion [5]

9. (a) Define acceptance angle and numerical aperture in optical fibre. How they are related to each other? [6]
(b) An optical fibre has a N.A. of 0.15 and a cladding refractive index is equal to 1.50. Find the N.A. of the fibre in a liquid of refractive index 1.30. [4]

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