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B. TECH.
FIRST SEMESTER EXAMINATION, 2017-18
PHYSICS

Time : **3 Hours**Max. Marks : **60**

Note : (i) Attempt **ALL** questions.
(ii) Choices are given in each question set.

1. Attempt any **Four** of the following questions: **3 x 4 = 12**
- (a) Explain the phenomena of double refraction in a calcite crystal. Describe the construction and working of a Nicol prism.
 - (b) Draw a neat diagram of helium-neon laser and describe its method of working. What are the characteristics of a laser beam? Discuss its important applications.
 - (c) What is optical activity? Describe working of a polarimeter.
 - (d) Obtain relation between Einstein's coefficients.
 - (e) What is principle of fibre optics? Describe acceptance angle, numerical aperture and fractional refractive index change in optical fibre.
 - (f) What do you mean by intermodal and intramodal dispersion?
2. Attempt any **Four** of the following questions: **3 x 4 = 12**
- (a) Discuss Langevin's theory of diamagnetism. Show that diamagnetic susceptibility is negative and independent of temperature and field strength.
 - (b) What is Meissner effect? Show that superconductors are perfect diamagnetic.

- (c) Differentiate between Type I and Type II superconductors.
- (d) Discuss introduction, synthesis, properties and uses of carbon nano-tubes.
- (e) Differentiate dia, para and ferromagnetic materials on the basis of their properties.
- (f) Discuss Hysteresis and explain its applications.
3. Attempt any **Two** of the following questions: **6 x 2 = 12**
- (a) Explain the phenomenon of diffraction and distinguish between Fresnel and Fraunhofer diffraction. Obtain the intensities of diffraction pattern in Fraunhofer diffraction due to a single slit.
- (b) Discuss the effect of introducing a thin plate in the path of any one of interfering beams in a biprism experiment. Derive the expression for the displacement of the fringes.
- (c) Describe and explain the formation of Newton's rings in reflected monochromatic light. Prove that in reflected light diameters of the dark rings are proportional to the square root of natural numbers.
4. Attempt any **Two** of the following questions: **6 x 2 = 12**
- (a) Briefly discuss the Michelson- Morley experiment and mention its outcome.
- (b) State the fundamental postulates of special theory of relativity. Deduce the Lorentz transformation equations.
- (c) (i) Deduce the relativistic velocity addition theorem. Show that it is consistent with the Einstein's second postulate of special theory of relativity.
- (ii) An electron is moving with a speed of $0.85c$ in a direction opposite to that of a moving photon. Calculate the relative velocities of the electron and photon.

5. Attempt any **Two** of the following questions: **6 x 2 = 12**
- (a) A particle is in motion along a line between $x = 0$ and $x = a$ with zero potential energy. At points for which $x < 0$ and $x > a$, the potential energy is infinite. Find the expression for the normalized wave function.
- (b) What is Compton effect? Deduce the expression for change in wavelength in Compton effect.
- (c) (i) What is Heisenberg's uncertainty principle? Show that electron cannot reside inside nucleus.
- (ii) Derive Schrodinger wave equation time dependent form.

