

TPH-101

1399

Odd Semester Examination 2018-19

B.TECH. (CSE)(Semester-I)

PHYSICS

Time: 03:00 Hours

Max. Marks:100

Note: Student needs to attempt all questions as per instructions given below. Each question carries equal marks.

1. This part contains 6 questions each of 5 marks. Students need to attempt any four :

- (a) Show that electrostatic energy density is equal to magnetostatic energy density in free space.
- (b) Explain why the diamagnetic materials have negative susceptibility?
- (c) Calculate the maximum order achieved by grating for wavelength 3800 Å if grating has 10000 number of lines in 1 cm.
- (d) Determine the frequency of the electromagnetic waves radiated by a Josephson junction across which a dc voltage of 0.5 mV is applied.
- (e) Discuss the postulates of quantum mechanics and write down the properties of wave function.
- (f) What is magnetic hysteresis loop ? Explain it with figure.

2. This part contains 6 questions each of 5 marks. Students need to attempt any four:

- (a) The proper life of pi-mesons is 2.5×10^{-8} s. What is the velocity of these mesons if the observed mean life is 2.5×10^{-7} s?
- (b) In single slit diffraction pattern, the distance between the first minima on either side of the central zero maximum is 4.4 mm as observed on a screen at a distance of 0.7 m. The wavelength of light used is 5890 Å. Calculate the slit width.

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- (c) Show that the commutation relation $[z, p_z] = i\hbar$.
- (d) What is the energy in joules of a mole of photons associated with visible light of wavelength 486 nm?
- (e) Discuss the variation of spontaneous magnetism with temperature in ferromagnetic materials.
- (f) Calculate the energy required for an electron to jump from ground state to the second excited state in a potential well of width L .

3. This part contains 3 questions each of 10 marks. Students need to attempt any two.

- (a) (i) What is the working principle of Newton's ring experiment and discuss its application.
- (ii) In a Newton's ring experiment, the diameter of the 15th ring was found to be 0.59 cm and that of the 5th ring was 0.336 cm. If the radius of curvature of plano-convex lens is 100 cm, calculate the wavelength of light used.
- (b) An incident 65 pm X-ray is incident on a calcite target. Find the wavelength of the X-ray scattered at an angle of 30° . What is the largest shift that can be expected in this experiment?
- (c) Describe the Langevin's theory of paramagnetism and obtain an expression for paramagnetic susceptibility. Comment on the temperature dependence of susceptibility.

4. This part contains 3 questions each of 10 marks. Student need to attempt any two:

- (a) What is meant by the relativistic length contraction? An observer is moving with velocity $0.6c$ making an angle 30° with a rod of length 5m. Calculate the length and the inclination of the rod w. r. t. the observer.
- (b) Discuss the effect of slit width, slit separation and wavelength of incident light on the diffraction pattern of single slit and based on it deduce the intensity distribution for two slits and N-slit diffraction.
- (c) What is Poynting vector? Show that vectors E , B and k are perpendicular to each other in a conducting medium.

5. This part contains 3 questions each of 10 marks. Students need to attempt any two:
- (a) Discuss Einstein's coefficient. In a laser action due to transition from the excited to the ground state, a beam of wavelength 6930 Å is obtained. Assuming the energy of ground state to be zero, find the energy of the excited state.
 - (b) The wave function for the one dimensional motion of a particle is $\psi = Ax$ when $0 \leq x \leq 1$. Calculate (i) the value of A (ii) the probability of finding a particle in the range $x = 0$ to $x = 0.5$ (iii) the expectation value of x .
 - (c) What are superconductors? What is the difference between a conductor cooled to 0 K and a superconductor? Show that the material gets cooled when its superconductivity is destroyed by a magnetic field.

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