JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -III EXAMINATION- DEC. 2019
B.Tech. I Semester (CSE, ECE, IT, CE)

COURSE CODE: 18B11PH111                                    MAX. MARKS: 35
COURSE NAME: ENGINEERING PHYSICS-I
COURSE CREDITS: 04                                         MAX. TIME: 2 Hrs

*Note: All questions are compulsory and carry equal marks. Carrying of mobile phone during examinations will be treated as case of unfair means. **Attempt all the questions in sequence.** Scientific calculator is allowed.*

1. A piece of a film having refractive index 1.4 has a wedge shape section. The thickness of the two opposite sides are $t_1$ and $t_2$. If 10 fringes appear in a light of wavelength 550 nm, calculate the difference between the thicknesses $(t_2 - t_1)$. Also, calculate the angle of wedge for fringe width of 1 mm.                                                                [CO-1]

2. In a double slit Fraunhofer diffraction pattern, a screen is placed 170 cm away from the slits. The width of the slits is 0.08 mm and they are 0.4 mm apart. Calculate the wavelength of light if the fringe width is 0.25 cm. Also find the missing order.                          [CO-2]

3. Explain the working of the half shade polarimeter (using diagram) to find the specific rotation. A sugar solution in tube of length 20 cm produces optical rotation of 13°. The solution is diluted to $1/3^{rd}$ of its previous concentration. Find optical rotation produced by 30 cm long tube containing the diluted solution.                                                        [CO-1]

4. What is normal Zeeman effect? Write an expression for Zeeman shift in wavelength. How LASERS can be classified on the basis of active medium?                              [CO-4]

5. Show that $x^2 + y^2 + z^2 = c^2t^2$ is invariant under Lorentz transformation.        [CO-3]

6. If a rod is moving with velocity 0.85c in the direction inclined at 60° to its own length. Calculate the percentage of length contracted.                                              [CO-3]

7. Show that the relation between the momentum and energy of a particle is given by
$E^2 = p^2c^2 + m_0^2c^4$, where $m_0$ is rest mass of particle.                          [CO-3]

8. Derive an expression for the time independent Schrödinger wave equation.              [CO-5]

9. Using Heisenberg uncertainty principle, show that electron doesn't exist inside the nucleus. An electron has speed of $1.05 \times 10^4$ m/s with an accuracy of 0.05%. Calculate the uncertainty in the position of electron.                                                  [CO-5]

10. State Carnot theorem. Develop an expression for the total work done using the Carnot cycle. Also find the efficiency relation.                                                    [CO-4]

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$m_e = 9.1 \times 10^{-31}$ kg; $e = 1.6 \times 10^{-19}$ C; $k_B = 1.38 \times 10^{-23}$ J/K, $h = 6.6 \times 10^{-34}$ Js