JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2023
B.Tech-I Semester (CSE/IT/ECE/CE/EC)

COURSE CODE (CREDITS): 18B11PH111 (4) MAX. MARKS: 35
COURSE NAME: Engineering Physics 1
COURSE INSTRUCTORS: HAZ, PBB, SKT, VSA, SKK, SBA, HSR MAX. TIME: 2 Hours

Note: (a)All questions are compulsory. (b)Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1 (a) Derive the expression for fringe width in wedge-shaped thin films in terms of refractive index and wedge angle. **[3-marks][CO-2]**

(b) A soap film of refractive index 1.33 is illuminated with light of different wavelength at an angle of 45°. There is complete destructive interference for λ=5890 Å. Find the thickness of the film. **[3-marks] [CO-4]**

Q2 (a) A Newton's ring experiment is performed with a source of light having two wavelength, λ_1 and λ_2. It is found that the n^{th} dark ring due to λ_1 coincides with $(n+1)^{th}$ dark ring due to λ_2, find the diameter of n^{th} dark ring for λ_1. Given that $\lambda_1=6 \times 10^{-5}$cm, $\lambda_2= 4.5 \times 10^{-5}$cm, radius of curvature= 90cm. **[3-marks] [CO-4]**

(b) In Newton's ring experiment, show that diameter of bright rings varies as square root of odd numbers. **[3-marks] [CO-2]**

Q3 (a) The path difference between the two interfering rays at a point is λ/8. Find the ration of intensity at this point to that at the center of a bright fringe. **[3-marks] [CO-4]**

(b) Calculate the Laplacian of the following functions, (i) $T= x^2+2xy+3z+4$ (ii) $T=\sin(x)\sin(y)\sin(z)$ **[2-marks] [CO-1]**

Q4 (a) Show that ratio of intensities in Fraunhofer diffraction due to double slit is 1: 1/22 **[3-marks][CO-3]**

(b) A single slit is illuminated by light composed of two wavelengths λ_1 and λ_2. One observes that due to Fraunhofer diffraction , the first minima obtained by λ_1 coincides with the second diffraction minima if λ_2. What will be the relation between λ_1 and λ_2. **[3-marks][CO-2]**

Q5 (a) Two spectral lines have wavelengths λ and λ+dλ, find out their angular separation in plane transmission grating experiment if grating constant is (e+d) and $d\lambda \ll \lambda$. **[3-marks][CO-3]**

(b) A hollow spherical shell caries charge density $\rho= kr^{-2}$ in the region $a \le r \le b$. Find the electric field in the region $r<a$, $a \le r \le b$ and $r>b$. **[3-marks][CO-1]**

Q6 (a) Two Nicoles have parallel polarizing directions so that the intensity of transmitted light is maximum. Through what angle must either Nicole be turned if the intensity is to drop by one fourth of its maximum value? **[3-marks][CO-4]**

(b) Two mutually perpendicularly linearly polarized wave superimpose at a point , obtain the expression of resultant polarized wave in terms of phase difference δ. Discuss the case of $\delta=\pi/2$ and π. **[3-marks][CO-3]**

$\varepsilon_o=8.85\times10^{-12}$ F/m; $\mu_o=4\pi\times10^{-7}$ H/m; $e=1.6\times10^{-19}$ C