Unit 4 - Week 2

Course outline

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Pre-requisite Assignment

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Week 2

- Lecture 06 : Basic Linear Optics (contd.)
- Lecture 07 : Basic Linear Optics (contd.)
- Lecture 08 : Basic Linear Optics (contd.)
- Lecture 09 : Basic Linear Optics (contd.)
- Lecture 10 : Nonlinear Optics : An Introduction
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Assignment Solution

Assignment 2

The due date for submitting this assignment has passed. **Due on 2018-08-15, 23:59 IST.**
As per our records you have not submitted this assignment.

1) *2 points*

Consider a wave propagating along the x-axis of a uniaxial medium. In what direc are the allowed wave solutions polarised

(a)x and y direction (b) x and z direction (c) z and y direction

- (a)
- (b)
- (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

2) *2 points*

If a plane wave has an electric field given by $\vec{E} = \frac{E_0}{\sqrt{2}}\{\cos(kz - \omega t + sin(kz - \omega t + \phi)\}\hat{x}$. The complex amplitude of the field will be

(a) $\frac{E_0}{2}e^{i\phi}$ (b) $\frac{E_0}{2}e^{i\left(\phi+\frac{\pi}{4}\right)}$ (c) $\frac{E_0}{2}e^{i\left(\phi+\frac{\pi}{2}\right)}$ (d) $\frac{E_0}{2}e^{i\left(\phi+3\frac{\pi}{4}\right)}$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

3) *2 points*

If the above (Q2) wave is incident on a metal with a susceptibility given by $\chi_0(1 - i\sqrt{3})/2$. Calculate the phase shift between the linear polarization ind by the field and the incident field.

(a)0° (b) 60° (c) 90° (d) 120°

- (a)

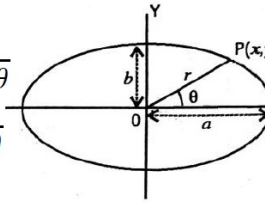
Accepted Answers:
(d)

4) **2 points**

In the figure the surface of an extraordinary wave surface in a positive cryst shown whose optic axis is along OX .What is the ray refractive index (n_θ) of medium at an angle θ to the optic axis.

(a) $\sqrt{n_0^2 \cos^2\theta + n_e^2 \sin^2\theta}$ (b) $\sqrt{n_0^2 \cos^2\theta - n_e^2 \sin^2\theta}$

(c) $\sqrt{n_0^2 \sin^2\theta + n_e^2 \cos^2\theta}$ (d) $\sqrt{n_0^2 \sin^2\theta - n_e^2 \cos^2\theta}$



- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

5) **2 points**

If the plane of vibration of incident beam makes an angle of 30° with the optic compare the intensities of ordinary and extraordinary rays

(a)3 (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 2

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

6) **2 points**

Find the principal indices of refraction for the following relative dielectric tensor

$$\overleftrightarrow{\epsilon}_r = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 2.5 & 0.5 \\ 0 & 0.5 & 2.5 \end{bmatrix}$$

(a) 4,4,1 (b) 6,2,1. (c) 2,3,4 (d) 3,3,3

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

7) **2 points**

Find the direction of the principal axes for the above relative dielectric tensor(Q6

(a) $\begin{bmatrix}0\\-1\\-1\end{bmatrix}, \begin{bmatrix}0\\0\\1\end{bmatrix}, \begin{bmatrix}1\\0\\0\end{bmatrix}$ (b) $\begin{bmatrix}0\\1\\-1\end{bmatrix}, \begin{bmatrix}0\\1\\1\end{bmatrix}, \begin{bmatrix}1\\0\\0\end{bmatrix}$ (c) $\begin{bmatrix}0\\-1\\-1\end{bmatrix}, \begin{bmatrix}0\\-1\\1\end{bmatrix}, \begin{bmatrix}1\\0\\0\end{bmatrix}$ (d) $\begin{bmatrix}0\\1\\-1\end{bmatrix}, \begin{bmatrix}0\\1\\1\end{bmatrix},$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

8) **2 points**

An electric field in a material that has the above dielectric tensor(Q6) has a con amplitude, $\vec{E} = \frac{E_0}{\sqrt{3}}(\hat{x} + \hat{y} + \hat{z})$.Find the angle between $\vec{E}$ and the displacer vector $(\vec{D})$

(a) 0° (b) 0.1°. (c) 8° (d) 20°

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

9) **2 points**

A plane wave propagates along a direction given by $\hat{\chi} = \frac{1}{\sqrt{2}}\hat{x} + \frac{1}{\sqrt{2}}\hat{z}$ in the un medium with $n_o = 2.35$ and $n_e = 2.24$. What is the angle made by the Pointing v $\vec{s}$ of the *e*-wave with *z*-axis.

(a)0° (b)23° (c) 47° (d) 53°

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

10) **2 points**

BBO is used in a second harmonic generation experiment. The fundam wavelength is $\lambda = 1.064\ \mu m$, and the angle between the direction of propag and the optic axis is 22.8°. Find the value of walk off angle (BBO refractive in at $0.532\mu m: n_0 = 1.67421, n_e = 1.55490$.)

(a) 26.008° (b) 22.8° (c) 3.2° (d) 10.5°

- (a)

(b)

(c)

(d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

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