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Courses » Introduction to Non-linear Optics and its Applications

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## Unit 3 - Week 1

### Course outline

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Pre-requisite Assignment

#### Week 1

- Lecture 01: Basic Linear Optics
- Lecture 02 : Basic Linear Optics (contd.)
- Lecture 03: Basic Linear Optics (contd.)
- Lecture 04 : Basic Linear Optics (contd.)
- Lecture 05 : Basic Linear Optics (contd.)
- Quiz : Week 1 Assignment 1
- Feedback for Week 1

#### Week 2

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Assignment Solution

### Week 1 Assignment 1

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2018-08-15, 23:59 IST.**

1) 2 points

Describe the state of polarization of the EM wave represented by  $\hat{i}E_0 \cos(kz - \omega t) - \hat{j}E_0 \cos(kz - \omega t)$ .

- (a) linearly polarized with resultant angle  $\frac{3\pi}{4}$  (b) circularly polarized  
(c) elliptically polarized (d) linearly polarized with resultant angle  $\frac{\pi}{3}$

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

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(a)

2) 2 points

An EM wave is propagating through a nonconducting medium of permittivity and permeability  $2\mu_0$ . The magnetic field associated with the wave is  $\hat{y}E_0 \cos(3z - \omega t) A/m$ . What is the speed of the wave inside the medium if speed of the light in free space is  $c$ .

- (a)  $0.5 \times 10^8 m/s$  (b)  $2.5 \times 10^8 m/s$  (c)  $0.95 \times 10^8 m/s$  (d)  $0.75 \times 10^8 m/s$

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

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
(c)

3) 2 points

An EM wave is propagating through a nonconducting medium of permittivity and permeability  $2\mu_0$ . The magnetic field associated with the wave is  $\hat{y}E_0 \cos(3z - \omega t) A/m$ . What is the amplitude of the associated electric field

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- (c)  
 (d)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(b)

4)

2 points

The energy associated with the EM wave described by the magnetic field  $\hat{y}E_0 \cos(7z - \omega t)$  A/m propagates along which direction

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

- (a)  
 (b)  
 (c)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(b)

5)

2 points

A light bulb of 20 W radiates isotropically. Assuming it a point source calculate the strength of the electric field ( $\vec{E}$ ) at a distance 1 m from the bulb

(a) 27.5 V/m (b) 29.5 V/m (c) 24.5 V/m (d) none of these

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

(c)

6)

2 points

The dispersion relation for EM waves in certain medium is given by  $\omega^2 =$  Where  $k$  is the propagation constant and  $\omega$  is the angular frequency. The velocity of the energy propagation in this medium is

(a)  $a/2\omega$  (b)  $a/4\omega$  (c)  $a/\omega$  (d)  $2a/\omega$

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

(a)

7)

2 points

Find the angular altitude (angle above the horizontal) of the sun for which sunlight will be reflected from a lake will be plane polarized. If the light comes inside the lake the critical angle is  $48.6^\circ$ .

(a)  $48.6^\circ$  (b)  $90^\circ$  (c)  $36.87^\circ$  (d)  $53.13^\circ$

- (a)

- (b)  
 (c)  
 (d)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(c)

8)

2 points

A plane EM wave travelling through a transparent medium is given by  $\vec{E}_0 \cos(0.4 \times 10^7 \pi x - 6\pi \times 10^{14} t)$  in SI units. Determine the refractive index of the material

- (a) 1.5      (b) 1.33      (c) 2      (d) 1.47

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

(c)

9)

2 points

Normally the refractive index of a transparent material

- (a) is independent of frequency  
 (b) decreases with increases in wavelength  
 (c) increases with increases in wavelength  
 (d) at first decreases and then increases with wavelength.

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

(b)

10)

0 points

The static dielectric constant of diamond is 5.50 and its refractive index at wavelength  $589.3 \mu\text{m}$  is 2.417. Fit this data into Sellmeier's dispersion formula with a single natural frequency. Find the free space wavelength corresponding to this natural frequency

- (a) 250 nm      (b) 156 nm      (c) 156  $\mu\text{m}$       (d) 15.6 nm

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

(b)

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