

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

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Week 9

Week 10

Week 11

Week 12

● Polarization modulated sensors - 1

● Polarization modulated sensors - 2

● Polarization modulated sensors - 3

● Optical Fiber Sensors : Week 12 Feedback Form

○ Quiz : Assignment 12

● Assignment 12 solutions

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Assignment 12

The due date for submitting this assignment has passed.

Due on 2021-04-14, 23:59 IST.

As per our records you have not submitted this assignment.

1) The propagation of a laser beam in free space is represented by its electric field as $E_s = 20(a_y + ja_z)e^{-j2.5x}$ Which of the following is the correct description of the field ? **1 point**

- Left circularly polarized beam propagating along +x direction
- Right circularly polarized beam propagating along +x direction
- Left elliptically polarized beam propagating along +x direction
- Right elliptically polarized beam propagating along -x direction

No, the answer is incorrect.
Score: 0

Accepted Answers:
Left circularly polarized beam propagating along +x direction

2) Comment on the following statements **1 point**
Statement (i): For an elliptically polarized light beam, the E-field amplitudes of orthogonal components should be same but phase difference between them need not be $\pm 90^\circ$

Statement (ii): For a circularly polarized light beam, the E-field amplitudes of orthogonal components should be same and the phase difference between them should be $\pm 90^\circ$

- (i) False, (ii) False
- (i) True, (ii) False
- (i) False, (ii) True
- (i) True, (ii) True

No, the answer is incorrect.
Score: 0

Accepted Answers:
(i) False, (ii) True

3) How many half wave plates (HWP) and quarter wave plates (QWP) are needed to covert light from one polarization state to any other polarization state in the Poincare' sphere ? **1 point**

- two HWPs and two QWPs
- one HWP and two QWPs
- Two HWPs and one QWP
- one QWP and one HWP

No, the answer is incorrect.
Score: 0

Accepted Answers:
one HWP and two QWPs

4) An optical element is used to convert light in one polarization state to another, both in the equatorial plane of the Poincare sphere. What element are we talking about?? **1 point**

- HWP
- QWP
- Polarizer
- Beam splitter

No, the answer is incorrect.
Score: 0

Accepted Answers:
HWP

5) If we perform Malus law experiment and find that the transmitted intensity is uniform for all orientation angles of the analyzer, the phase difference between the orthogonal components is likely to be ____ degrees.(enter the positive integer value)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 89,91

1 point

6) Polarization diversity scheme is a good way of sensing the change in polarization state in a perturbed medium. Which of the following optical components is used to facilitate the polarization diversity scheme ? **1 point**

- HWP
- QWP
- Circulator
- Polarization Beam splitter

No, the answer is incorrect.
Score: 0

Accepted Answers:
Polarization Beam splitter

7) **Assertion:** Polarization diversity scheme is the best approach in providing zero background and twice the sensitivity. **1 point**

Reason: The differential signal obtained from the two detectors is proportional to twice the Faraday rotation, with zero DC component.

- Both Assertion and Reason are correct
- Assertion is correct but the Reason is not correct
- Both Assertion and reason are wrong
- Assertion is wrong but the Reason is correct

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both Assertion and Reason are correct

8) A linearly polarized light wave traveling in the +z direction is incident on a 1 cm long terbium aluminium garnet (TAG) crystal. Due to Faraday rotation in TAG, the polarization rotates by an angle θ in x-y plane. The magnitude of magnetic flux density required to rotate the incoming linear polarization by an angle of 45° is ____ Tesla. (enter the value in two decimal accuracy). [Assume the Verdet constant of TAG as $-41 \text{ rad}/(\text{T}\cdot\text{m})$]

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.71,2.1

1 point

Instructions for Questions 9 and 10

A fiber optic current sensor of loop radius 5 cm is designed to measure the amount of current that causes to rotate the polarization of incoming light beam.

9) If 100 A of current is flowing through the conductor which is placed at the center of the fiber loop then the magnitude of the magnetic flux density generated in this loop is ____ mTesla.(one decimal accuracy) [Assume relative permeability of the medium as 1 and $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$]

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.3,0.5

1 point

10) If the Verdet constant of fused silica is $-38 \text{ rad}/(\text{T}\cdot\text{m})$ and the fiber length is given as 60 cm, the light polarization is rotated by ____ degrees. (enter the value in two decimal accuracy)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.4,0.6

1 point