

Unit 5 - Week 4

Course outline

How does an NPTEL online course work?

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Week 2

Week 3

Week 4

● Electromagnetic Analysis of Waveguides - VI

○ Electromagnetic Analysis of Waveguides - VII

● Electromagnetic Analysis of Waveguides - VIII

○ Optical Fiber Waveguide - I

● Optical Fiber Waveguide - II

○ Quiz : Assignment 4

● Solution : Assignment 4

Week 5

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Assignment 4

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

Due on 2020-02-26, 23:59 IST.

1) The direction of propagation of electromagnetic wave in air is same as:

1 point

- Direction of electric field
 Direction of magnetic field
 Direction of poyinting vector
 None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Direction of poyinting vector

2) A dielectric step index symmetric planar waveguide $n_1 = 1.48$, $n_2 = 1.46$, $d = 5 \mu m$ supports TE₀ and TE₁ modes at $\lambda_0 = 1.06 \mu m$. The propagation constants for TE₁ mode is $8.7268 \mu m^{-1}$. Calculate the penetration depths of TE₁ modes in n_2 region

1 point

- 0.58 μm
 0.86 μm
 0.95 μm
 1.15 μm

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.86 μm

3) Consider a dielectric step-index asymmetric planar waveguide with $n_f = 1.475$, $n_s = 1.450$, $n_c = 1$, $d = 4 \mu m$ at $\lambda_0 = 1.06 \mu m$. The number of guided modes are

1 point

- 8
 5
 2
 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

4) A dielectric step index symmetric planar waveguide $n_1 = 1.48$, $n_2 = 1.46$, $d = 5 \mu m$ supports TE₀ and TE₁ modes at $\lambda_0 = 1.06 \mu m$. The propagation constant for TE₁ mode is $8.7268 \mu m^{-1}$. At $z = 0$, the electric field in the guiding film is given by $E_y(x) = 1.375 \times 10^4 \cos(\kappa_0 x)e^{i\omega t} + 1.309 \times 10^4 \sin(\kappa_1 x)e^{i\omega t}$ V/m. What is the power carried by TE₁ mode?

1 point

- 0.01 W/m
 0.08 W/m
 1.13 W/m
 2.21 W/m

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.13 W/m

5) Consider a dielectric step-index asymmetric planar waveguide with $n_f = 1.475$, $n_s = 1.450$, $n_c = 1$, $\lambda = 5 \mu m$. Out of the following options, in which the waveguide does not support any mode?

1 point

- $d = 2 \mu m$

 $d = 5 \mu m$

 $d = 7 \mu m$

 $d = 9 \mu m$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $d = 2 \mu m$

6) For a dielectric step-index asymmetric planar waveguide, what should be the value of asymmetry parameter so that TE₀ mode is just cut-off at $V = 0.5$.

1 point

- 4.2
 3.4
 2.4
 1.5

No, the answer is incorrect.
Score: 0

Accepted Answers:
2.4

7) Consider a dielectric step-index asymmetric planar waveguide with $n_f = 1.475$, $n_s = 1.450$, $n_c = 1$, $d = 4 \mu m$. Find the cut off wavelength for TE₁ mode.

1 point

- 1.00 μm

 1.52 μm

 2.75 μm

 3.85 μm

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.52 μm

8) Consider a dielectric step-index asymmetric planar waveguide with $n_f = 1.475$, $n_s = 1.450$, $n_c = 1$, $d = 2 \mu m$. Calculate the range of wavelength for SPSM operation

1 point

- $0.94 \mu m < \lambda < 1.03 \mu m$

 $1.08 \mu m < \lambda < 1.75 \mu m$

 $1.92 \mu m < \lambda < 2.85 \mu m$

 $2.34 \mu m < \lambda < 2.57 \mu m$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $2.34 \mu m < \lambda < 2.57 \mu m$

9) Consider a step index fiber with $n_1 = 1.475$, $n_2 = 1.450$, $a = 2 \mu m$. Calculate its cut off wavelength.

1 point

- 2.5 μm

 1.4 μm

 0.9 μm

 0.3 μm

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.4 μm

10) Consider a dielectric step-index asymmetric planar waveguide with $n_f = 1.475$, $n_s = 1.45$, $n_c = 1$. find the range of d for SPSM operation at $\lambda_0 = 1 \mu m$.

1 point

- $0.35 \mu m < d < 0.52 \mu m$

 $0.41 \mu m < d < 0.65 \mu m$

 $0.78 \mu m < d < 0.85 \mu m$

 $1.06 \mu m < d < 1.97 \mu m$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $0.78 \mu m < d < 0.85 \mu m$