Unit 7 - Week 4 Lectures

Course outline

Assignment-4

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

Due on 2019-08-28, 23:59 IST.

1) Which of the following expressions is incorrect *1 point*

$$E_r = \frac{-j}{\omega^2 \mu\varepsilon - \beta^2}\left(\beta\frac{\partial E_z}{\partial r} + \frac{\mu\omega}{r}\frac{\partial H_z}{\partial \phi}\right)$$

$$E_\phi = \frac{-j}{\omega^2 \mu\varepsilon - \beta^2}\left(\frac{\beta}{r}\frac{\partial E_z}{\partial r} - \mu\omega\frac{\partial H_z}{\partial \phi}\right)$$

$$H_r = \frac{-j}{\omega^2 \mu\varepsilon - \beta^2}\left(\beta\frac{\partial H_z}{\partial r} - \frac{\omega\varepsilon}{r}\frac{\partial E_z}{\partial \phi}\right)$$

$$H_\phi = \frac{-j}{\omega^2 \mu\varepsilon - \beta^2}\left(\frac{\beta}{r}\frac{\partial H_z}{\partial \phi} + \omega\epsilon\frac{\partial E_z}{\partial r}\right)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$$E_\phi = \frac{-j}{\omega^2 \mu\varepsilon - \beta^2}\left(\frac{\beta}{r}\frac{\partial E_z}{\partial r} - \mu\omega\frac{\partial H_z}{\partial \phi}\right)$$

2) The expression for E_z outside the step-index fiber core is ($w^2 = \beta^2 - k_2^2, u^2 = k_1^2 - \beta^2, k_1 = \frac{2\pi n_{core}}{\lambda}, k_2 = \frac{2\pi n_{clad}}{\lambda}$, consider C to be an arbitrary constant) *1 point*

- $CK_\nu(wr)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $CK_\nu(ur)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $CJ_\nu(ur)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $CJ_\nu(wr)e^{j\nu\phi}e^{j(\omega t-\beta z)}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$CK_\nu(wr)e^{j\nu\phi}e^{j(\omega t-\beta z)}$

3) The expression for E_z inside the step-index fiber core is ($w^2 = \beta^2 - k_2^2, u^2 = k_1^2 - \beta^2, k_1 = \frac{2\pi n_{core}}{\lambda}, k_2 = \frac{2\pi n_{clad}}{\lambda}$, consider A to be an arbitrary constant) *1 point*

- $AJ_\nu(wr)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $AK_\nu(ur)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $AJ_\nu(ur)e^{j\nu\phi}e^{j(\omega t-\beta z)}$
- $AK_\nu(wr)e^{j\nu\phi}e^{j(\omega t-\beta z)}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$AJ_\nu(ur)e^{j\nu\phi}e^{j(\omega t-\beta z)}$

4) In a step-index optical fiber, the condition for mode propagation constant (β) of an excited mode is ($k_1 = \frac{2\pi n_{core}}{\lambda}, k_2 = \frac{2\pi n_{clad}}{\lambda}$) *1 point*

- $\beta \le k_2$
- $k_2 \le \beta \le k_1$
- $\beta \ge k_1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$k_2 \le \beta \le k_1$

5) A certain optical fiber has the following parameters: core radius of 4 μm, core and cladding refractive indices of 1.45 and 1.444 respectively, and operating wavelength of 1064 nm. V-number of the fiber is *1 point*

- 3.11
- 1.82
- 2.405
- 3.5

No, the answer is incorrect.
Score: 0

Accepted Answers:
3.11

6) For the fiber given in Question 5 to act as a single mode fiber, the minimum operating wavelength is *1 point*

- 1550 nm
- 1377 nm
- 1250 nm
- 880 nm

No, the answer is incorrect.
Score: 0

Accepted Answers:
1377 nm

7) HE_{11} mode is the fundamental mode of an optical fiber. *1 point*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

8) If a mode propagating in an optical fiber has $|H_z| > |E_z|$ ($H_z \ne 0, E_z \ne 0, \nu \ne 0$) the mode is called as *1 point*

- TE mode
- TM mode
- HE mode
- EH mode

No, the answer is incorrect.
Score: 0

Accepted Answers:
EH mode

9) Which of the following Bessel function properties is incorrect *1 point*

- $2J_\nu'(z) = J_{\nu-1}(z) - J_{\nu+1}(z)$
- $J_{-\nu}(z) = (-1)^\nu J_\nu(z)$
- $2K_\nu'(z) = K_{\nu-1}(z) - K_{\nu+1}(z)$
- $K_{-\nu}(z) = K_\nu(z)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$2K_\nu'(z) = K_{\nu-1}(z) - K_{\nu+1}(z)$