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Courses » Modern Optics

Announcements

Course Ask a Question Progress

Mentor

FAQ

## Unit 5 - Week 4

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Veek 1	1)			1 μ
	Read the following pa	ragraph and answer the	questions? (SINGLE CO	ORRECT OPTION) Q.1 - Q.4
leek 2			_	o horizontal parallel interfaces
leek 3				rface is at $z=d$ . The core and
/eek 4	cladding layers have R waveguide.	I's $oldsymbol{n_1}$ and $oldsymbol{n_2}$ respectively	/. The EM wave is trave	elling from left to right along th
Lecture 18 : Waves	_			
in guided structures	The set of electric and	magnetic field compone	nts that constitute the	TM mode of this structure is
and modes	(A) $H_y, E_z, E_x$	(B) $H_x, E_y, E_z$	(C) $H_z, E_x, E_y$	(D) $H_x, H_y, E_z$
Lecture 19 : Waves in guided structures and modes (contd.)	O A.			122 22 2
Lecture 20 : Waves	○ в.			
in guided structures and modes (contd.)	O c.			
Lecture 21 : Waves	O D.			
in guided structures and modes (contd.)	No, the answer is inco	rrect.		
Lecture 22 : Waves	Score: 0 Accepted Answers:			
in guided structures and modes (contd.)	B.			
Lecture 23 : Waves	2)			1
in guided structures		ide, the RI varies as $n^2$ =	= n <sup>2</sup> (z), i.e., indepen	dent of $x$ – and $y$ –coordinat
and modes (contd.)		ave equation for this stru		
Lecture Materials	(A) $\vec{E} = \vec{E}(x) e^{i(\omega t)}$	$-k_x x - k_y y$	(B) $\vec{E} = \vec{E}(x, y)$	$e^{i(\omega t - k_z z)}$
Quiz : Week 4 Assignment 4	(C) $\overrightarrow{E} = \overrightarrow{E}(y) e^{i(\omega t)}$		(D) $\vec{E} = \vec{E}(z) e$	
Feedback for Week	O A.			
	0 B			
ek 5				
ek 6	© C.			
ek 7	No, the answer is inco	rrect		
eek 8	Score: 0			
	Accepted Answers:			
eek 9	D.			

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About the electric and magnetic field components of guided modes of this waveguide which of the
following is true?
(A) Each of the field components $H_x$ , $H_z$ , $E_x$ , $E_z$ can be expressed in terms of $H_y$ and $E_y$
(B) Each of the field components $H_x$ , $H_y$ , $E_x$ , $E_y$ can be expressed in terms of $H_z$ and $E_z$
(C) All the field components $H_x$ , $H_y$ , $H_z$ , $E_x$ , $E_y$ , and $E_z$ cannot satisfy time-independent wave
equation (Helmholtz's equation)
(D) Both <b>TE-</b> and <b>TM</b> modes cannot co-exist/ propagate simultaneously in this waveguide
O A.
В.
O c.
O D.
No, the answer is incorrect.
Score: 0
Accepted Answers:
A.
4) <b>1</b> point
Which of the following statements about the modes of this waveguide is true?
(A) For a <b>TE-</b> mode to be guided in this structure the condition: $k_0^2 n_1^2 > k_y^2 > k_0^2 n_2^2$ must be satisfied
(B) A mode whether <b>TE</b> or <b>TM</b> will be guided in this waveguide only if $k_y^2 < k_0^2 n_2^2$
(C) If the field amplitude in the cladding is oscillatory, i.e., of the form $e^{\pm ik_z z}$ , then it corresponds to a
guided mode
(D) the condition that the waveguide will carry more than one guided <b>TE</b> modes for a light of
wavelength $\lambda_0$ is $\lambda_0 \geq 2d \sqrt{n_1^2 - n_2^2}$
<ul><li>□ A.</li><li>□ B.</li><li>□ C.</li><li>□ D.</li></ul>
No, the answer is incorrect.
Score: 0 Accepted Answers:
A.
5) <b>1 point</b>
Read the following paragraph and answer the questions? (SINGLE CORRECT OPTION) Q.5 - Q.8
Given that the RI's of core and cladding of a symmetric planar dielectric waveguide are respectively
$n_1=1.50$ and $n_2=1.48$ . The width of the core is $d$ .
For a light of wavelength $\lambda_0 = 1.5  \mu m$ , the waveguide supports only one mode (single-mode
operation). The width of the core is then
(A) $d \le 3.07  \mu m$ (B) $d \ge 4.13  \mu m$ (C) $d = 4.07  \mu m$ (D) $d \ge 6.13  \mu m$
А. В. С. D.
No, the answer is incorrect. Score: 0
Accepted Answers:
A.
6) 1 point

A. B. C. D. No, the answer is incorrect. Score: 0  Accepted Answers: A. 7)	(A) a	$\leq 1.53  \mu m$	(B	$d \geq 2.06  \mu m$	l	(C) $d = 2.03  \mu r$	n	(D) $d \ge 3.06  \mu r$
No, the answer is incorrect. Score: 0  Accepted Answers:  A. 7, 1 poin How many guided modes (total number of modes) will be supported in this waveguide when its corewidth is $d=12.3~\mu m$ and the operating wavelength is $\lambda_0=750~nm$ ?  (A) B   (B) 6   (C) 4   (D) 2  A. B. C. D. No, the answer is incorrect. Score: 0  Accepted Answers:  A. 3 $\mu m$ . Then which one of the following corresponds to propagation constant of the TE mode?  (A) $\beta_{TE}=6.45.74~\mu m^{-1}$   (B) $\beta_{TE}=64.574~\mu m^{-1}$   (C) $\beta_{TE}=645.74~\mu m^{-1}$   (D) $\beta_{TE}=645.74~\mu m^{-1}$   (E) $\beta_{TE}=645.74~\mu m^{-1}$	_			*)		•		
No, the answer is incorrect. Score: 0  D.  No, the answer is incorrect. Score: 0  Accepted Answers:  A  7)  1 poin  1 thow many guided modes (total number of modes) will be supported in this waveguide when its corewidth is $d=12.3~\mu m$ and the operating wavelength is $\lambda_0=750~nm$ ?  (A) B  (B) 6  (C) 4  (D) 2  A  B  C.  D.  No, the answer is incorrect. Score: 0  Accepted Answers:  A  3)  One such waveguide having core-cladding RI's as $n_1=1.5$ and $n_2=1.0$ has $V=3.0$ at a wavelength $\lambda_0=1.3~\mu m$ . Then which one of the following corresponds to propagation constant of the TE mode?  (A) $\beta_{TE}=6.4574~\mu m^{-1}$ (B) $\beta_{TE}=64.574~\mu m^{-1}$ (C) $\beta_{TE}=645.74~\mu m^{-1}$ (D) $\beta_{TE}=645.74~\mu m^{-1}$ No, the answer is incorrect. Score: 0  D.  No, the answer is incorrect. Score: 0  1 poin Choose the correct answer/s. (MULTIPLE CORRECT OPTION) Q.9-Q.12  For practical waveguides, the difference in the core-cladding RI's is small, i.e., $n_1 \approx n_2$ (weakly guiding structure). For such waveguides that supports only one TE- and one TM modes, which of the following facts is/are true?  (A) Propagation constants of TE mode and corresponding TM mode are nearly equal  (B) A TE mode and the corresponding TM mode exhibit very nearly similar field pattern  (C) The longitudinal field components for both TE- and corresponding TM mode are very large compared to the transverse field components  (D) The modes are almost transverse (like free space propagation), i.e., transverse field components								
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Score: 0  Accepted Answers: $A$ 7)		D.						
The point of the			et.					
How many guided modes (total number of modes) will be supported in this waveguide when its corewidth is $d=12.3~\mu m$ and the operating wavelength is $\lambda_0=750~nm$ ?  (A) 8 (B) 6 (C) 4 (D) 2  A. B. C. D. No, the answer is incorrect.  Score: 0  Accepted Answers:  A. B) One such waveguide having core-cladding RI's as $n_1=1.5$ and $n_2=1.0$ has $V=3.0$ at a wavelength $\lambda_0=1.3~\mu m$ . Then which one of the following corresponds to propagation constant of the TE mode?  (A) $\beta_{TE}=6.4574~\mu m^{-1}$ (B) $\beta_{TE}=64.574~\mu m^{-1}$ (C) $\beta_{TE}=645.74~\mu m^{-1}$ (D) $\beta_{TE}=6457.4~\mu m^{-1}$ A. B. C. D. No, the answer is incorrect. Score: 0  Accepted Answers:  A  9) C. D. No, the answer is incorrect. Score: 0  Accepted Answers:  A  9) Choose the correct answer/s. (MULTIPLE CORRECT OPTION) Q.9-Q.12  For practical waveguides, the difference in the core-cladding RI's is small, $Le, n_1 \approx n_2$ (weakly guiding structure). For such waveguides that supports only one TE- and one TM modes, which of the following facts is/are true?  (A) Propagation constants of TE mode and corresponding TM mode are nearly equal  (B) A TE mode and the corresponding TM mode are nearly equal  (B) A TE mode and the corresponding TM mode are nearly equal  (C) The longitudinal field components for both TE- and corresponding TM mode are very large compared to the transverse field components  (D) The modes are almost transverse field components	Acce	epted Answers:						
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width is $d=12.3~\mu m$ and the operating wavelength is $\lambda_0=750~nm$ ?  (A) 8 (B) 6 (C) 4 (D) 2  A. B. C. D. No, the answer is incorrect. Score: 0  Accepted Answers: A. B) 1 point one such waveguide having core-cladding Ri's as $n_1=1.5~$ and $n_2=1.0~$ has $V=3.0~$ at a wavelength $\lambda_0=1.3~\mu m$ . Then which one of the following corresponds to propagation constant of the TE mode?  (A) $\beta_{TE}=6.4574~\mu m^{-1}$ (B) $\beta_{TE}=64.574~\mu m^{-1}$ (C) $\beta_{TE}=645.74~\mu m^{-1}$ (D) $\beta_{TE}=645.74~\mu m^{-1}$ A. B. C. D. No, the answer is incorrect. Score: 0  Accepted Answers: A. 9) 1 point one of the following corresponding Ri's is small, $ke, n_1 \approx n_2$ (weakly guiding structure). For such waveguides that supports only one TE- and one TM modes, which of the following facts is/are true?  (A) Propagation constants of TE mode and corresponding TM mode are nearly equal (B) A TE mode and the corresponding TM mode exhibit very nearly similar field pattern (C) The longitudinal field components for both TE- and corresponding TM mode are very large compared to the transverse field components								1 point
(A) 8 (B) 6 (C) 4 (D) 2  A.  B.  C.  D.  No, the answer is incorrect. Score: 0  Accepted Answers:  A.  B)  One such waveguide having core-cladding Ri's as $n_1 = 1.5$ and $n_2 = 1.0$ has $V = 3.0$ at a wavelength $\lambda_0 = 1.3  \mu m$ . Then which one of the following corresponds to propagation constant of the TE mode?  (A) $\beta_{TE} = 6.4574  \mu m^{-1}$ (B) $\beta_{TE} = 64.574  \mu m^{-1}$ A.  B.  C.  D.  No, the answer is incorrect. Score: 0  Accepted Answers:  A.  9)  Choose the correct answer/s. (MULTIPLE CORRECT OPTION) Q.9-Q.12  For practical waveguides, the difference in the core-cladding Ri's is small, i.e., $n_1 \approx n_2$ (weakly guiding structure). For such waveguides that supports only one TE- and one TM modes, which of the following facts is/are true?  (A) Propagation constants of TE mode and corresponding TM mode are nearly equal  (B) A TE mode and the corresponding TM mode exhibit very nearly similar field pattern  (C) The longitudinal field components for both TE- and corresponding TM mode are very large compared to the transverse field components  (D) The modes are almost transverse (like free space propagation), i.e., transverse field components							wavegui	de when its core-
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□ c.			
No, the answer is inco	rrect.		
Score: 0			
Accepted Answers:			
В.			
D.			
10)			1 point
	<b>E</b> mode ( <b>0</b> <sup>th</sup> order <b>TE</b> ) of a	symmetric planar slab wave	
	ity/quantities will lie betw		
(A) $\kappa \frac{d}{2}$	(B) $\gamma \frac{d}{2}$	(C) $V = k_0 \frac{d}{2} \sqrt{n_1^2 - n_2^2}$	(D) $\kappa \frac{d}{2} \tan \kappa \frac{d}{2}$
А. В. С.			
No, the answer is inco	rrect.		
Accepted Answers:			
A.			
В.			
C. D.			
			4
11)	clah wayoguida, the trans	verse field amplitude of a gu	1 point
		verse field amplitude of a gu positions. Then this mode m	
(A) a symmetric <b>TE</b> m		(B) an antisymmetric <b>TE</b>	16.10 day - 26
(C) a symmetric <b>TM</b> r		(D) an antisymmetric TN	
(c) a symmetric min	node	(D) an and symmetric 114	Mode
■ A.			
□ <sub>B</sub> .			
C.			
D.			
No, the answer is inco	rrect.		
Score: 0			
Accepted Answers:			
В.			
D.			
12)			1 point
		lab waveguide, the field patt	ern of the lowest order
(fundamental) mode i		/n\	
(A) a Hermite-Gaussi		(B) a purely Gaussian fur	nction
(C) a Bessel's functio	ns	(D) Airy functions	
O A.			
О в.			
C.			
O D.			
No, the answer is inco	rrect.		
Accepted Answers:			
B.			

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End