Jedant Milind Athavale	TY BTECH EXTC , Page No. 01		
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-> In medium 2, the transmitted frelds are:

$$H_{ts} = \frac{E_{to} (-\cos\theta_t a_x + \sin\theta_t a_z) e^{-j\beta_2(x\sin\theta_t + z\cos\theta_t)}}{\eta^2}$$

→ Now, in order to statisty the Maxuell's equation, the tangential components of EhH should be continuous at z=0 & i.e., setting Or = 0; , we get,

$$\frac{1}{1} \left(E_{io} - E_{to} \right) \cos \theta_{i} = 1 \quad E_{to} \cos \theta_{t}$$

$$\frac{1}{1} \left(E_{io} - E_{to} \right) \cos \theta_{i} = 1 \quad E_{to} \cos \theta_{t}$$

-> Now, by expressing Ero & Eto in terms of Eio fetches us

$$T_{\perp} = \frac{E_{10}}{E_{10}} = \frac{\eta_{2} \cos \theta_{1} - \eta_{1} \cos \theta_{t}}{\eta_{2} \cos \theta_{1} + \eta_{1} \cos \theta_{t}}$$

$$= \frac{\eta_{2} \cos \theta_{1} - \eta_{1} \cos \theta_{t}}{\eta_{2} \cos \theta_{1} + \eta_{1} \cos \theta_{t}}$$

From (i) h (ii)

$$T_1 = E_{to} = 2\eta_2 \cos \theta_i$$

$$E_{io} \qquad \eta_2 \cos \theta_i + \eta_1 \cos \theta_t$$

i.e., Fto = TI Fio

This is the fresencis equation for perpendicular polarization.

	-			F .
110-11	tro	=	6	tio
Hence,				

For normal incidence,
$$\theta_i = \theta_t = 0$$

Lets suplace O; with Brewsters angle OB,.

i-e.
$$\eta_2^2(1-\sin^2\Theta_{B_1}) = \eta_1^2(1-\sin\Theta_t^2)$$

- For nonmagnetic media (lu= lu= luo), sin²0g-30.

Alm, it litely & Ey=E, then

$$sin \Theta_{B_1} = J_1 2$$
 $J_1 + J_1 2$

Hence, proved.

Practice P	noblems -	Sadiku

- 1) Problem No. 10.10
 - If E = (10 ay + 5 az) ws (wt + 2y-4z) V/m in free space,

Find :-

a.) w & x :-

Now, K = -2ay + 4az $\therefore 1K1 = \sqrt{2^2 + 4^2} = \sqrt{20}$

 $\omega = KC = 3 \times 10^8 \sqrt{20} = 1.342 \times 10^9 \text{ rad/s}$

: X = 2TK = 28-1m

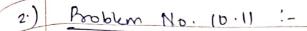
b.) Magnetic field component H:-

 $\rightarrow H = \frac{Q_{K} \times E}{\gamma_{0}} = \frac{(-2a_{y} + 4a_{z})}{\sqrt{20}(120\pi)} \times \frac{(10a_{y} + 5a_{z})\cos(\cot(-\kappa x))}{\sqrt{20}(120\pi)}$

= -29.66 cos (1.342 × 10°t +2y-4z) ax mA/m

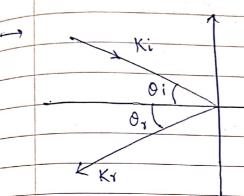
c.) Time ang. power:

= -74.15ay +148.9az W/m²



If the plane wave of practice problem 10.10 is incident on a directlic medium having $\sigma = 0$, $\varepsilon = 4\varepsilon_0$, $\mu = \mu_0 2$ occupying z > 0, calculate:

(a) The angles of incidence, reflection, and transmission:



$$\tan \theta_1 = K_{iy} = 2$$
 $K_{iz} = 4$

·. 0, = 26.56° = 07

$$-i. \sin \theta_{\pm} = \frac{\mu_1 \, \epsilon_1}{\sqrt{\mu_2 \, \epsilon_2}} \Rightarrow \frac{\sin \theta_{\pm} = 1 \, \sin (26.56)}{2}$$

(b.) The reflection and transmission wetkings:-

 \rightarrow $M_1 = N_0$, $M_2 = N_0/2$, E is parallel to the plane of incidence. Since $\mu_1 = \mu_2 = \mu_0$,

 $\frac{\Gamma_{11} = \tan (\theta_{1} - \theta_{1})}{\tan (\theta_{1} + \theta_{1})} = \tan (-13.64^{\circ}) = -0.2946}$

 $T_{11} = 2 \cos(26.50^{\circ}) \sin(12.92^{\circ}) = 0.6474$ $\sin(9.48^{\circ}) \cos(-13.67^{\circ})$ (c.) The total E in the free space:

-> Kr = - By sin Dray - B, cos Draz

New, Ky. Ey = 0 or T. Ey = 0.

Let Er = + Eor (-cost, ay +sin0, az)

Cos (wt. + B, sin O, y + B, cos 0, z)

Only, (+) sign will satisfy

Et = Fot (ws 0, ay + Sin 0, az) cos (cot + 2y -4z)

: 0, =0,

Eur cos Or = THE Eur cos Q = 10 TH = -2.946

Earsin 0, = [, Eo, sin 0, = 5], = -1.473

 $\beta_1 \sin \theta_r = 2$ $\Rightarrow \beta_1 \cos \theta_r = 4$

:. Er = - (2.946 ay - 1.473 az) cos (cot + 2y + 4z)

 $E_1 = E_1 + E_Y = (10ay + 5a_z) \cos(\omega t + 2y - 4z) + (-).946a_1 + 1.473a_2 \cos(\omega t + 2y + 4z)$

V/m

(d) The total E field in the dielectric:

 $Kt = -\beta_1 \sin \theta_1 a_y + \beta_1 \cos \theta_1 a_2$

Since, Kr. Er = 0, Let,

Et = Eot (ws O ay + sin O az) ws (wt + Bzysin O 1 - Bz z ws O 1)

 $\beta_{1} = \omega \int_{\mu_{2}} \xi_{1} = \beta_{1} \int \xi_{1} = 2 \int_{20}$

 $\sin\theta_t = \frac{1}{2}\sin\theta_t = \frac{1}{2\sqrt{5}}$, $\cos\theta_t = \frac{\sqrt{9}}{\sqrt{20}}$

 $\beta_2 = 2\sqrt{20} = 8.718$

 $\text{fot } = 0.6474 \sqrt{125} \sqrt{\frac{19}{20}}$

= 7.055

 $Eot Sin \theta_1 = Z_{11} Eot sin \theta_1 = 0.6474 \sqrt{125} \sqrt{1}$

= 1.6185

Hence,

Ez = Et = (7.055 ay + 1.6185 az) cos (cot +2y - 8.718z) V/m

	Page No
(e)	The Brewstein Angle:
	$tan \theta_{BH} = \frac{\epsilon_2}{\epsilon_1} = 2$
	$=$ $\theta_{B11} = 63.43^{\circ}$
	