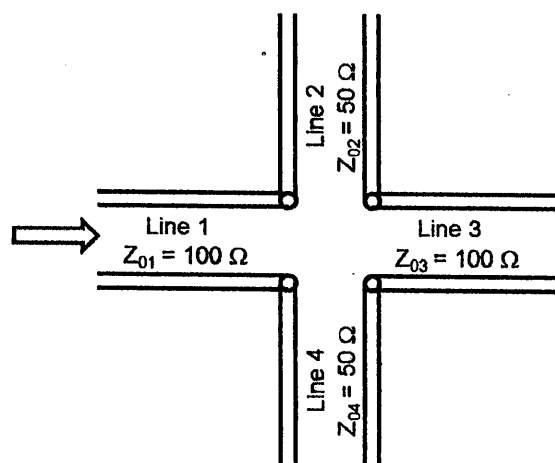


類組：電機類 科目：電磁學 B(3008)

※請在答案卷內作答

1. (15%) A transmission line signal carrying power P is incident on the cross junction from Line 1. Please answer the following questions.



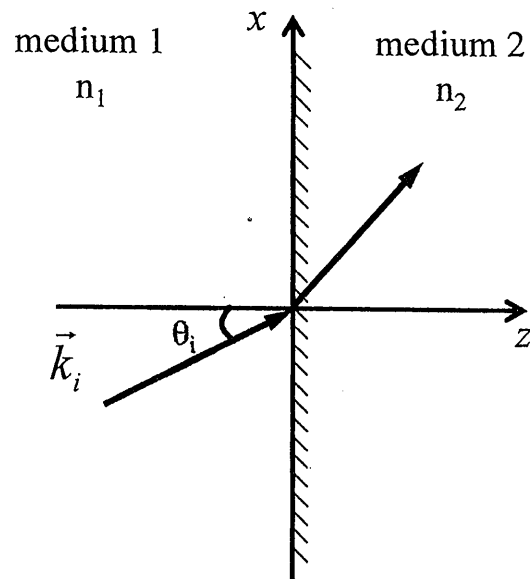
- (1A) (5%) What is the power reflected into Line 1?
- (1B) (5%) What is the power transmitted into Line 2?
- (1C) (5%) What is the power transmitted into Line 3?
2. (5%) The profile of a harmonic wave, traveling at 1.2 m/s on a string, is given by
- $$y = (0.02m)\sin(157m^{-1})x$$
- Determine its amplitude, wavelength, frequency, and period.
3. (5%) A plane, harmonic, linearly polarized light wave has an electric field intensity given by
- $$E_z = E_0 \cos \pi 10^{15} \left(t - \frac{x}{0.65c} \right) \quad (\text{V/m})$$
- while traveling in a piece of glass. Find
- (3A) (2%) The frequency of the light
- (3B) (1%) Its wavelength
- (3C) (2%) The index of refraction of the glass
4. (5%) What is the momentum and energy of a 10^{19} -Hz X-ray photon?
5. (20%) Prove that a linearly polarized plane wave can be resolved into a right-hand circularly polarized wave and a left-hand circularly polarized wave, and vice versa.

注意：背面有試題

類組：電機類 科目：電磁學 B(3008)

※請在答案卷內作答

6. (10%) Assuming that the radiation magnetic field intensity of an antenna is $\vec{H} = \hat{a}_\theta H_\theta + \hat{a}_\phi H_\phi$. Find the expression for the average outward power flow per unit area.
7. (10%) Are the field patterns in a cavity resonator traveling waves or standing waves? How do they differ from those in a waveguide?
8. (10%) Explain why single-conductor hollow or dielectric-filled waveguides cannot support TEM waves?
9. (10%) The laws of geometrical optics can be derived from Fermat's principle. Please state Fermat's principle and derive from the principle the law of refraction for oblique incidence on a plane boundary between two different perfect dielectric media.
10. (10%) As shown below, an electromagnetic wave passes from medium 1 with a refractive index n_1 to medium 2 with a refractive index n_2 , where $n_2 > n_1$ and both are perfect dielectric media. If the incident angle θ_i exceeds the critical angle θ_c , there is no refracted but only a reflected wave in medium 1. But the field is not zero in medium 2, and we get a disturbance called evanescent wave. Assume the incident wave is with amplitude E_0 , angular frequency ω , and wavevector \vec{k}_i . From the condition of $\theta_i > \theta_c$, please show your derivation to construct an expression for the electric field of the evanescent wave if the incident wave is a TE wave. The final expression should be expressed only in terms of the given parameters: E_0 , ω , n_1 , n_2 , θ_i , and c (the speed of light).



注意：背面有試題