Abstracts

The Application of Z-Transform Techniques the Analysis of Paraxial Ray Propagation in Beam Waveguides

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The Z-transform technique has been applied to the effect of lateral lens displacements on the propagation of paraxial rays in a lens guide. The Z transform of the ray displacement from the guide axis is obtained and techniques for obtaining the ray displacement from its Z transform are outlined. The property of the transform that determines the stability of the ray in the guide is given. To illustrate its use, the transform is used to obtain the response of the ray to the following types of lens displacements: 1) any arbitrary sequence of displacements, 2) sinusoidal lens displacements of arbitrary frequency, 3) sinusoidal lens displacements at the ray position resonant frequency, and 4) lens displacements that form a bend in the guide. Also an analogy is shown to exist between the response of linear circuits to amplitude modulated pulse trains, which is a function of time, and the response of the light ray to lateral lens displacements, which is a function of the distance of propagation down the guide.

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