Abstracts

Transversely Anisotropic Optical Fibers: Variational Analysis of a Nonstandard Eigenproblem

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The variational principle for nonstandard eigenvalue problems, recently reported by one of the authors, is applied for the study of guided-wave propagation in an anisotropic dielectric waveguide. A stationary functional is derived for the general dielectric waveguide with transverse anisotropy. The functional is tested for the well-known case of an isotropic step-index single-mode fiber. It is seen that for simple trial functions with only two parameters, a good accuracy is obtained. For two types of transversely anisotropic step-index fibers, relations between the propagation factor, anisotropy parameter, dielectric parameter, and frequency are calculated. The functional does not assume weak guidance condition nor perturbational anisotropy and, hence, is also applicable for other dielectic waveguides. In this application, only a modest computer or a programmable calculator is needed. Moreover, the spurious modes causing confusion in the finite-element method of calculation do not appear with the present method.

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