- 7.2-3 Normal-to-Axis Wave in a 1D Periodic Medium. Use the results of Prob. 7.2-2 to show that there are no bandgaps for a wave traveling along the lateral direction of a 1D periodic medium, i.e., for K = 0.
  - 7.2-2 Off-Axis Wave in 1D Periodic Medium. Derive equations analogous to those provided in (7.2-24)–(7.2-28) for an off-axis wave traveling through a 1D periodic medium with a transverse wavevector k<sub>x</sub>.

$$C_m = \sum_{\ell \neq m} \frac{\eta_{m-\ell}}{\eta_o} \frac{(K + \ell g)(K + mg)}{(\bar{n}\omega/c_o)^2 - (K + mg)^2} C_\ell, \quad m = 0, \pm 1, \pm 2, ...,$$
 (7.2-24)

$$\omega \bar{n}/c_0 \approx |K + mg|$$
. (7.2-25)

$$C_0 = \frac{\eta_1}{\eta_0} \frac{(K - g)K}{\omega^2 \bar{n}^2 / c_0^2 - K^2} C_{-1}, \qquad (7.2-26)$$

$$C_{-1} = \frac{\eta_1^*}{\eta_0} \frac{K(K-g)}{\omega^2 \bar{n}^2 / c_0^2 - (K-g)^2} C_0, \qquad (7.2-27)$$

where  $\eta_{-1} = \eta_1^*$ . These equations are self-consistent if

$$\frac{|\eta_1|^2}{\eta_0^2} \, K^2 (K - g)^2 = \left[ \omega^2 \frac{\tilde{n}^2}{c_o^2} - K^2 \right] \left[ \omega^2 \frac{\tilde{n}^2}{c_o^2} - (K - g)^2 \right]. \tag{7.2-28}$$
 Dispersion Relation

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