Appendix E

Eigenvalues

E.1 Jacket mode eigenvalues

The functional form of jacket modes used in our calculations is given by equation (5.11). These functions are forced to satisfy the boundary conditions,

$$\frac{\partial \Phi_J}{\partial s} + \frac{\nu^2}{m}\Phi_J = 0 \tag{E.1}$$

at $s = 1$ and $s = D$. Defining

$$N_J(\kappa_n^J, \mu, s) = \frac{1/2+\mu}{s} M_{-i\kappa_n^J,-\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right) - \frac{i\nu^2}{\kappa_n^J} M'_{-i\kappa_n^J,-\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right) - \frac{\nu^2}{m} M_{-i\kappa_n^J,-\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right), \tag{E.2}$$

and

$$D_J(\kappa_n^J, \mu, s) = -\frac{1/2+\mu}{s} M_{-i\kappa_n^J,\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right) + \frac{i\nu^2}{\kappa_n^J} M'_{-i\kappa_n^J,\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right) + \frac{\nu^2}{m} M_{-i\kappa_n^J,\mu}\left(\frac{i\nu^2}{\kappa_n^J}s\right), \tag{E.3}$$

the eigenvalues κ_n^J are determined through the relation

$$N_J(\kappa_n^J, \mu, 1) D_J(\kappa_n^J, \mu, D) = N_J(\kappa_n^J, \mu, D) D_J(\kappa_n^J, \mu, 1). \tag{E.4}$$

Subsequently, the constant η_n^J in equation (5.11) is obtained:

$$\eta_n^J = \frac{N_J(\kappa_n^J, \mu, 1)}{D_J(\kappa_n^J, \mu, 1)} = \frac{N_J(\kappa_n^J, \mu, D)}{D_J(\kappa_n^J, \mu, D)}. \tag{E.5}$$

E.2 p-mode eigenvalues

The functional form of p-modes, given by equation (5.9), has to satisfy

$$\frac{\partial \Phi_p}{\partial s} + \frac{\nu^2}{m}\Phi_p = 0, \tag{E.6}$$

at $s = 1, D$. Following the formulism in the appendix E.1, we define N_p, D_p as:

$$N_p(\kappa_n^p, \mu, s) = \frac{1/2+\mu}{s} M_{\kappa_n^p,-\mu}\left(\frac{\nu^2}{\kappa_n^p}s\right) - \frac{\nu^2}{\kappa_n^p} M'_{\kappa_n^p,-\mu}\left(\frac{\nu^2}{\kappa_n^p}s\right) - \frac{\nu^2}{m} M_{\kappa_n^p,-\mu}\left(\frac{\nu^2}{\kappa_n^p}s\right), \tag{E.7}$$

and

$$D_p(\kappa_n^p, \mu, s) = -\frac{1/2+\mu}{s} M_{\kappa_n^p,\mu}\left(\frac{\nu^2}{\kappa_n^p}s\right) + \frac{\nu^2}{\kappa_n^p} M'_{\kappa_n^p,\mu}\left(\frac{\nu^2}{\kappa_n^p}s\right) + \frac{\nu^2}{m} M_{\kappa_n^p,\mu}\left(\frac{i\nu^2}{\kappa_n^p}s\right), \tag{E.8}$$

and determine the eigenvalue κ_n^p and constant ζ_n^p in equation (5.9) through the following relations, respectively:

$$N_p(\kappa_n^p, \mu, 1) D_p(\kappa_n^p, \mu, D) = N_p(\kappa_n^p, \mu, D) D_p(\kappa_n^p, \mu, 1), \tag{E.9}$$

$$\zeta_n^p = \frac{N_p(\kappa_n^p, \mu, 1)}{D_p(\kappa_n^p, \mu, 1)} = \frac{N_p(\kappa_n^p, \mu, D)}{D_p(\kappa_n^p, \mu, D)}. \tag{E.10}$$