$$\frac{1}{\varepsilon}(1+\Delta)f''' + \Delta\Xi' + G_r\theta + G_m\phi + \frac{1}{\varepsilon^2}ff'' - \left(K + \frac{M\alpha_e}{\alpha_e^2+\beta_e^2}\right)f' + \left(R - \frac{M\beta_e}{\alpha_e^2+\beta_e^2}\right)g - \Gamma f'^2 = 0 \quad (1)$$

$$\frac{1}{\varepsilon}(1+\Delta)g'' + \frac{1}{\varepsilon^2}fg' - \left(K + \frac{M\alpha_e}{(\alpha_e^2+\beta_e^2)}\right)g - \left(R - \frac{M\beta_e}{(\alpha_e^2+\beta_e^2)}\right)f' - \Gamma g^2 = 0 \quad (2)$$

$$\Lambda\Xi'' + f'\Xi + f\Xi' - 2\lambda\Xi - \lambda f'' = 0 \quad (3)$$

$$\theta'' + (1+\Delta)P_rE_c[f''^2 + g'^2] + \frac{ME_cP_r}{(\alpha_e^2+\beta_e^2)}[f'^2 + g^2] + P_rf\theta' - S_TP_rf' = 0 \quad (4)$$

$$\emptyset'' + fS_c\emptyset' - S_T^*S_cf' + S_0S_c\theta'' + R_cS_c\emptyset = 0 \quad (5)$$

Corresponding boundary conditions

$$f' = 1, f = f_w, \quad g = 0, \Xi = -\frac{1}{2}f'', \theta = 1 - \frac{1}{2}S_T, \phi = 1 - \frac{1}{2}S_T^* \quad at \ \eta = 0$$

$$f' = 0\,, g = 0, \Xi_1 = 0, \Xi_2 = 0, \quad \theta = 0, \phi = 0 \quad at \ \eta \to \infty \quad (6)$$

Value of parameters

$f_w = 0.5$
M=0.5
$\beta_i = 0.3$
$\beta_e = 0.4$
$\Delta = 2.0$
R=0.6
Gr=4.0
Gm=2.0
Pr=0.71
Ec=0.5
$s = 0.5$
$S_0 = 1.0$
K=0.5
Sc=0.6
$\Gamma = 0.5$
$\varepsilon = 0.6$
$S_T = 0.5$
$S_T^* = 0.5$
$\Lambda = 2.0$
$\lambda = 0.5$