$$\frac{1}{\varepsilon}(1+\Delta)f''' - \Delta\Xi_2' + G_r\theta + G_m\phi + \frac{1}{\varepsilon^2}ff'' - \left(K + \frac{M\alpha_e}{\alpha_e^2+\beta_e^2}\right)f' + \left(R - \frac{M\beta_e}{\alpha_e^2+\beta_e^2}\right)g - \Gamma f'^2 = 0 \quad (1)$$

$$\frac{1}{\varepsilon}(1+\Delta)g'' + \Delta\Xi_1' + \frac{1}{\varepsilon^2}fg' - \left(K + \frac{M\alpha_e}{(\alpha_e^2+\beta_e^2)}\right)g - \left(R - \frac{M\beta_e}{(\alpha_e^2+\beta_e^2)}\right)f' - \Gamma g^2 = 0 \quad (2)$$

$$\Lambda\Xi_1'' + \Xi_1 f' + f\Xi_1' = 0 \quad (3)$$

$$\Lambda\Xi_2'' + \Xi_2 f' + f\Xi_2' = 0 \quad (4)$$

$$\theta'' + (1+\Delta)P_r E_c[f''^2 + g'^2] + \frac{E_c M P_r}{(\alpha_e^2+\beta_e^2)}[f'^2 + g^2] + P_r f\theta' - S_T P_r f' = 0 \quad (5)$$

$$\emptyset'' + fS_c\emptyset' - S_T^* S_c f' + S_0 S_c \theta'' - R_c S_c \emptyset = 0 \quad (6)$$

Corresponding boundary conditions

$$f' = 1, f = f_w, \quad g = 0, \Xi_1 = -s_1 g', \quad \Xi_2 = s_1 f'', \theta = 1 - \frac{1}{2}S_T, \phi = 1 - \frac{1}{2}S_T^* \quad at \ \eta = 0$$

$$f' = 0\,, g = 0, \Xi_1 = 0, \Xi_2 = 0, \quad \theta = 0, \phi = 0 \quad at \ \eta \to \infty \quad (7)$$

Again

$$f''' = \frac{\varepsilon\Delta}{1+\Delta}\Xi_2' - \frac{\varepsilon}{1+\Delta}G_r\theta - \frac{\varepsilon}{1+\Delta}G_m\phi - \frac{1}{1+\Delta}\frac{1}{\varepsilon}ff'' + \frac{\varepsilon}{1+\Delta}\left(K + \frac{M\alpha_e}{(\alpha_e^2+\beta_e^2)}\right)f' - \frac{\varepsilon}{1+\Delta}\left(R - \frac{M\beta_e}{(\alpha_e^2+\beta_e^2)}\right)g$$
$$+ \frac{\varepsilon}{1+\Delta}\Gamma f'^2 \quad (8)$$

$$g'' = -\frac{\varepsilon\Delta}{1+\Delta}\Xi_1' - \frac{1}{1+\Delta}\frac{1}{\varepsilon}fg' + \frac{\varepsilon}{1+\Delta}\left(K + \frac{M\alpha_e}{(\alpha_e^2+\beta_e^2)}\right)g + \frac{\varepsilon}{1+\Delta}\left(R - \frac{M\beta_e}{(\alpha_e^2+\beta_e^2)}\right)f'$$
$$+ \frac{\varepsilon}{1+\Delta}\Gamma g^2 \quad (9)$$

$$\Xi_1'' = -\frac{1}{\Lambda}\Xi_1 f' - \frac{1}{\Lambda}f\Xi_1' \quad (10)$$

$$\Xi_2'' = -\frac{1}{\Lambda} + \Xi_2 f' - \frac{1}{\Lambda}f\Xi_2' \quad (11)$$

$$\theta'' = -(1+\Delta)P_r E_c[f''^2 + g'^2] - \frac{E_c M P_r}{(\alpha_e^2+\beta_e^2)}[f'^2 + g^2] - P_r f\theta' + S_T P_r f' \quad (12)$$

$$\emptyset'' = -fS_c\emptyset' + S_T^* S_c f' - S_0 S_c\theta'' + R_c S_c\emptyset \quad (13)$$

Corresponding boundary conditions

$$f' = 1, \quad f = f_w, \quad g = 0, \quad \Xi_1 = -s_1 g', \quad \Xi_2 = s_1 f'', \ \theta = 1 - \frac{1}{2}S_T, \phi = 1 - \frac{1}{2}S_T^* \quad at \ \eta = 0$$

$$f' = 0\,, \quad g = 0, \ \Xi_1 = 0, \ \Xi_2 = 0, \quad \theta = 0, \ \phi = 0 \quad at \ \eta \to \infty \quad (14)$$

Consider the value of the parameters

M=0.5
$\alpha_e = 1 + \beta_e \beta_i = 2.1$
$\beta_i = 0.7$
$\beta_e = 0.4$
R=0.6
Gr=10.0
Gm=5.0
Pr=0.71
Ec=0.01
$s_1 = 0.5$
$So = 1.0$
K=0.5
Sc=0.6
$\Delta = 0.5$
$\Gamma = 0.5$
$\varepsilon = 0.6$
$S_T = 0.5$
$S_T^* = 0.5$
$\Lambda = 3.0$