## **Figures Caption**

Figure 1.1:	Newtonian fluid
Figure 1.2:	Non–Newtonian fluid
Figure 1.3:	Induced current in a moving conductive fluid in the presence of a magnetic field
Figure 2.1:	Physical sketch of the problem
Figure 2.2:	Velocity profile for different values of y and M for $k = 0.8$ , $Pr = 10$ , $Sc = 6.2$ , $Gr =$
	3, Gm = 2, R = 5, kr = 10, Sr = 5
Figure 2.3:	Velocity profile for different values of y and k for $M = 5$ , $Pr = 10$ , $Sc = 6.2$ , $Gr =$
	3, Gm = 2, R = 5, kr = 10, Sr = 5
Figure 2.4:	Velocity profile for different values of y and Sc for $M = 5, k = 0.8, Pr = 10, Gr =$
	3, Gm = 2, R = 5, kr = 10, Sr = 5
Figure 2.5:	Velocity profile for different values of y and R for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Gr = 3, Gm = 2, kr = 10, Sr = 5
Figure 2.6:	Temperature profile for different values of $\theta$ and <i>R</i> for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Sr = 3, Gm = 2, kr = 10, Sr = 5
Figure 2.7:	Velocity profile for different values of y and Kr for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Gr = 3, Gm = 2, kr = 10, Sr = 5
Figure 2.8:	Concentration profile for different values of C and Kr for $M = 5, k = 0.8, Pr = 10$ ,
	Sc = 6.2, Gr = 3, gm = 2, R = 5, Sr = 5
Figure 2.9:	Velocity profile for different values of y and Sr for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Gr = 3, Gm = 2, R = 5, kr = 10
Figure 2.10:	Concentration profile u for different values of C and Sr for $M = 5, k = 0.8, Pr =$
	10, Sc = 6.2, Gr = 3, Gm = 2, R = 5, kr = 10
Figure 2.11:	Velocity profile for different values of y and Gr for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Gm = 2, R = 5, kr = 10, Sr = 5
Figure 2.12:	Velocity profile for different values of y and Gm for $M = 5, k = 0.8, Pr = 10, Sc =$
	6.2, Gr = 3, R = 5, kr = 10, Sr = 5
Figure 2.13:	Temperature profile for different values of $\theta$ and $Pr$ for $M = 5, k = 0.8, Sc = 6.2,$
	Gr = 3, Gm = 2, R = 5, kr = 10, Sr = 5

- **Figure 3.1:** Physical sketch of the problem
- Figure 3.2: Velocity profile for different values of y and  $\alpha$  at k = 0.8, M = 5, Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, Kr = 5, H = 3, R = 5 and t = 0.4
- Figure 3.3: Velocity profile for different values of y and M at k = 0.8,  $\alpha = 0.5$ , Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, Kr = 5, H = 3, R = 5 and t = 0.4
- Figure 3.4: Velocity profile for different values of y and k at  $M = 5, \alpha = 0.5, Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, Kr = 5, H = 3, R = 5 and t = 0.4$
- Figure 3.5: Velocity profile for different values of y and R at  $M = 5, \alpha = 0.5, Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, Kr = 5, H = 3, k = 0.8 and t = 0.4$
- **Figure 3.6:** Temperature profile for different values of y and R at Pr = 7, H = 3 and t = 0.4
- Figure 3.7: Velocity profile for different values of y and H at  $M = 5, \alpha = 0.5, Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, Kr = 5, R = 5, k = 0.8 and t = 0.4$
- **Figure 3.8:** Temperature profile for different values of y and H at Pr = 7, R = 5 and t = 0.4
- Figure 3.9: Velocity profile for different values of y and Kr at  $M = 5, \alpha = 0.5, Pr = 7, Sc = 0.66, Gm = 4, Gr = 5, H = 3, R = 5, k = 0.8 and t = 0.4$
- **Figure 3.10:** Concentration profile for different values of y and Kr at Sc = 0.66, and t = 0.4.
- **Figure 4.1:** Physical sketch of the problem
- **Figure 4.2:** *h* curve for f''(0)
- **Figure 4.3:** *h* curve for  $\theta'(0)$
- **Figure 4.4:** h curve for C'(0)
- Figure 4.5: Velocity Profile for Different value of *M* at  $k = 0.5, Gr = 1, \gamma = 0.7, Pr = 0.71$ , Sr = 3, Df = 1, Sc = 0.22, R = 0.2, Kr = 0.2 and H = 0.1
- Figure 4.6: Velocity Profile for Different value of  $\gamma$  at at M = 0.5, k = 0.5, Gr = 1, Gm = 1, Pr = 0.71, Sr = 3, Df = 1, Sc = 0.22, R = 0.2, Kr = 0.2 and H = 0.1
- Figure 4.7: Velocity Profile for Different value of Gr at at  $M = 0.5, k = 0.5, \gamma = 0.7, Gm = 1$ , Pr = 0.71, Sr = 3, Df = 1, Sc = 0.22, R = 0.2, Kr = 0.2 and H = 0.1
- Figure 4.8: Velocity Profile for Different value of Gm at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1$ , Pr = 0.71, Sr = 3, Df = 1, Sc = 0.22, R = 0.2, Kr = 0.2 and H = 0.1
- Figure 4.9: Temperature Profile for values of R at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Sr = 3, Df = 1, Sc = 0.22, Kr = 0.2 and H = 0.1$

- Figure 4.10: Temperature Profile for values of Df at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1$ , Gm = 1, Pr = 0.71, Sr = 3, R = 0.2, Sc = 0.22, Kr = 0.2 and H = 0.1
- Figure 4.11: Concentration Profile for values of Df at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Sr = 3, R = 0.2, Sc = 0.22, Kr = 0.2 and H = 0.1$
- Figure 4.12: Temperature Profile for values of Sr at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Df = 1, R = 0.2, Sc = 0.22, Kr = 0.2 and H = 0.1$
- Figure 4.13: Concentration Profile for values of Sr at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Df = 1, R = 0.2, Sc = 0.22, Kr = 0.2 and H = 0.1$
- Figure 4.14: Temperature Profile for values of H at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Sr = 3, Df = 1, R = 0.2, Sc = 0.22 and Kr = 0.2$
- Figure 4.15: Concentration Profile for values of Sr at  $M = 0.5, k = 0.5, \gamma = 0.7, Gr = 1, Gm = 1, Pr = 0.71, Sr = 3, Df = 1, R = 0.2, Sc = 0.22 and H = 0.1$
- Figure 5.1: Physical sketch of the problem
- Figure 5.2: The H-Curve of f''(0) for 7th & 8th HAM approximation at M = 1.2, Pr = 6.7, s = 0.01, Bi = 0.1, Nb = 0.2, Nt = 0.2, Le = 0.5, K = 0.05, Kr = 0.2, R = 2.0
- Figure 5.3: f' for  $\eta$  and K at M = 1.2, s = 0.01, Pr = 6.7, Nb = 0.2, R = 2.0, Nt = 0.2, Le = 0.5, Kr = 0.2, Bi = 1.0
- Figure 5.4: f' for  $\eta$  and M at K = 0.05, Bi = 0.1, s = 0.01, Pr = 6.7, Nb = 0.2, Nt = 0.2, Le = 0.5, Kr = 0.2, R = 2.0
- Figure 5.5: f' for  $\eta$  and s at M = 0.4, Le = 0.5, Pr = 6.7, Nb = 0.2, Nt = 0.2, Bi = 0.1, K = 0.05, Kr = 0.2, R = 2.0.
- Figure 5.6:  $\theta$  for  $\eta$  and Kr at M = 1.2, s = 0.01, Nt = 0.2, Nb = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, Bi = 0.1, R = 2.0
- Figure 5.7:  $\theta$  for  $\eta$  and Kr at M = 1.2, s = 0.01, Nt = 0.2, Nb = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, Bi = 0.1, R = 2.0.
- Figure 5.8:  $\theta$  for  $\eta$  and K at M = 1.2, Bi = 0.1, s = 0.01, Nt = 0.2, Nb = 0.2, Le = 0.5, Pr = 6.7, Kr = 0.2, R = 2.0.
- Figure 5.9:  $\theta$  for  $\eta$  and M at Le = 0.5, Bi = 0.1, s = 0.01, Nt = 0.2, Nb = 0.2, K = 0.05, Pr = 6.7, Kr = 0.2, R = 2.0.

- **Figure 5.10:**  $\theta$  for  $\eta$  and Nb at M = 1.2, Bi = 0.1, s = 0.01, Nt = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, Kr = 0.2, R = 2.0.
- Figure 5.11:  $\theta$  for  $\eta$  and R at M = 1.2, Bi = 0.1, Nb = 0.2, Nt = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2.
- Figure 5.12:  $\theta$  for  $\eta$  and Nt at M = 1.2, Bi = 0.1, s = 0.01, Nb = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, Kr = 0.2, R = 2.0.
- Figure 5.13:  $\theta$  for  $\eta$  and Pr at M = 1.2, Bi = 0.1, s = 0.01, Nt = 0.2, Le = 0.5, K = 0.05, Nb = 0.2, Kr = 0.2, R = 2.0.
- Figure 5.14:  $\theta$  for  $\eta$  and s at M = 1.2, Bi = 0.1, Nb = 0.2, Nt = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, Kr = 0.2, R = 2.0.
- Figure 5.15: *C* for  $\eta$  and *Bi* at M = 1.2, Nb = 0.2, Nt = 0.2, Le = 0.5, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.16: *C* for  $\eta$  and *Kr* at Le = 0.5, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, Pr = 6.7, s = 0.01, M = 1.2, R = 2.0.
- Figure 5.17: C for  $\eta$  and K at M = 1.2, Bi = 0.1, Nb = 0.2, Nt = 0.2, Le = 0.5, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.18: *C* for  $\eta$  and Le at M = 1.2, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.19: C for  $\eta$  and Le at M = 1.2, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.20: C for  $\eta$  and Nb at Le = 0.5, Bi = 0.1, M = 1.2, Nt = 0.2, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.21: *C* for  $\eta$  and *R* at Le = 0.5, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, Pr = 6.7, s = 0.01, M = 1.2, Kr = 0.2
- Figure 5.22: C for  $\eta$  and Nt at Le = 0.5, Bi = 0.1, Nb = 0.2, M = 1.2, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.23: C for  $\eta$  and Pr at Le = 0.5, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, M = 1.2, s = 0.01, Kr = 0.2, R = 2.0.
- Figure 5.24: *C* for  $\eta$  and s at Le = 0.5, Bi = 0.1, Nb = 0.2, Nt = 0.2, K = 0.05, Pr = 6.7, M = 1.2, Kr = 0.2, R = 2.0.

Figure 5.25:	Effect of Viscoelastic parameter K on Skin friction coefficient at $Le = 0.5$ , $Bi = 0.1$ ,
	Nb = 0.2, Nt = 0.2, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
Figure 5.26:	Effect of Brownian motion parameter $Nb$ on the Nusselt number at $Le = 0.5$ , $Bi =$
	0.1, $M = 1.2$ , $K = 0.05$ , $Pr = 6.7$ , $s = 0.01$ , $Kr = 0.2$ , $R = 2.0$ .
Figure 5.27:	Effect of Brownian motion parameter $Nb$ on Sherwood number at $Le = 0.5$ , $Bi = 0.1$ ,
	M = 1.2, K = 0.05, Pr = 6.7, s = 0.01, Kr = 0.2, R = 2.0.
Figure 6.1:	Physical sketch of the problem
Figure 6.2:	h-curve of $f''(\eta)$ , $g'(\eta)$ and $\theta'(\eta)$
Figure 6.3:	h-curve of $\mathcal{C}'(\eta)$
Figure 6.4:	$f(\eta)$ for $M$ at $\gamma = 1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1, $
	$0.22, Df = 1 \ and \ R = 5$
Figure 6.5:	$f'(\eta)$ for M at $\gamma = 1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1, S$
	0.22, Df = 1 and R = 5.
Figure 6.6:	$g(\eta)$ for M at $\gamma = 1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1, Sc$
	0.22, Df = 1 and R = 5.
Figure 6.7:	$f(\eta)$ for $\gamma$ at $M = 0.1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1$
	0.22, Df = 1 and R = 5
Figure 6.8:	$f'(\eta)$ for $\gamma$ at $M = 0.1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb =$
	0.1, Sc = 0.22, Df = 1 and R = 5.
Figure 6.9:	$g(\eta)$ for $\gamma$ at $M = 0.1, k_1 = 0.5, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1$
	0.22, Df = 1 and R = 5.
Figure 6.10:	$f(\eta)$ for $k_1$ at $\gamma = 1, M = 0.1, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1, Nb = 0.1, Sc = 0.1, Nb = 0.1, Sc = 0.1, $
	0.22, Df = 1 and R = 5.
Figure 6.11:	$f'(\eta)$ for $k_1$ at $\gamma = 1, M = 0.1, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1,$
	0.22, Df = 1 and R = 5.
Figure 6.12:	$g(\eta)$ for $k_1$ at $\gamma = 1, M = 0.1, R_k = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.1, $
	0.22, Df = 1 and R = 5.
Figure 6.13:	$f(\eta)$ for $R_k$ at $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.00$
	0.22, Df = 1 and R = 5.

- Figure 6.14:  $f'(\eta)$  for  $R_k$  at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.15:  $g(\eta)$  for  $R_k$  at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.16:  $\theta(\eta)$  for Pr at  $\gamma = 1, k_1 = 0.5, M = 0.1, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.17:  $C(\eta)$  for Pr at  $\gamma = 1$ ,  $k_1 = 0.5$ , M = 0.1, Re = 1, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5
- Figure 6.18:  $f(\eta)$  for Re at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, R_k = 0.5, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.19:  $f'(\eta)$  for Re at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, R_k = 0.5, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.20:  $g(\eta)$  for Re at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, R_k = 0.5, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.21:  $\theta(\eta)$  for Re at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5$
- Figure 6.22:  $C(\eta)$  for Re at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5$
- Figure 6.23:  $\theta(\eta)$  for Nb at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Re = 1, Sc = 0.22, Df = 1 and R = 5$
- Figure 6.24:  $C(\eta)$  for Nb at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Re = 1, Sc = 0.22, Df = 1 and R = 5.$
- Figure 6.25:  $\theta(\eta)$  for Nt at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Pr = 10, Re = 1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5$
- Figure 6.26:  $C(\eta)$  for Nt at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Pr = 10, Re = 1, Nb = 0.1, Sc = 0.22, Df = 1 and R = 5$
- Figure 6.27:  $\theta(\eta)$  for *Sc* at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Re = 1, Df = 1 and R = 5$
- Figure 6.28:  $C(\eta)$  for Sc at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Re = 1, Df = 1 and R = 5$

## XXIII

- Figure 6.29:  $\theta(\eta)$  for Df at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Re = 1 and R = 5$
- Figure 6.30:  $C(\eta)$  for Df at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Re = 1 and R = 5$
- Figure 6.31:  $\theta(\eta)$  for R at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Re = 1 and Df = 1$
- Figure 6.32:  $C(\eta)$  for R at  $\gamma = 1, M = 0.1, k_1 = 0.5, Pr = 10, Pr = 10, Nt = 0.1, Nb = 0.1, Sc = 0.22, Re = 1 and Df = 1$
- Figure 7.1: Physical sketch of the problem.
- **Figure 7.2:** *h* -curve of  $f''(\eta)$
- **Figure 7.3:** h-curve of  $g'(\eta)$
- **Figure 7.4:** h-curve of  $\theta'(\eta)$
- **Figure 7.5:** h-curve of  $C'(\eta)$
- **Figure 7.6:**  $f(\eta)$  for different values of  $k_1$
- **Figure 7.7:**  $f'(\eta)$  for different values of  $k_1$
- **Figure 7.8:**  $g(\eta)$  for different values of  $k_1$
- **Figure 7.9:**  $f(\eta)$  for different values of *M*
- **Figure 7.10:**  $f'(\eta)$  for different values of *M*
- **Figure 7.11:**  $g(\eta)$  for different values of *M*
- **Figure 7.12:**  $f(\eta)$  for different values of Kr
- **Figure 7.13:**  $f'(\eta)$  for different values of  $R_k$
- **Figure 7.14:**  $g(\eta)$  for different values of  $R_k$
- **Figure 7.15:**  $\theta(\eta)$  for different values of *Nb*
- **Figure 7.16:**  $C(\eta)$  for different values of *Nb*
- **Figure 7.17:**  $\theta(\eta)$  for different values of *R*
- **Figure 7.18:**  $C(\eta)$  for different values of *R*
- **Figure 7.19:**  $\theta(\eta)$  for different values of *Nt*
- **Figure 7.20:**  $C(\eta)$  for different values of *Nt*
- **Figure 7.21:**  $\theta(\eta)$  for different values of  $\varphi$
- **Figure 7.22:**  $C(\eta)$  for different values of  $\varphi$

- **Figure 7.23:**  $\theta(\eta)$  for different values of *Pr*
- **Figure 7.24:**  $C(\eta)$  for different values of Pr
- **Figure 7.25:**  $\theta(\eta)$  for different values of *Sc*
- **Figure 7.26:**  $C(\eta)$  for different values of *Sc*
- **Figure 7.27:** Skin Friction Coefficient  $C_f$  for different values of  $k_1$
- **Figure 7.28:** Skin Friction Coefficient  $C_f$  for different values of  $R_k$
- **Figure 7.29:** Skin Friction Coefficient  $C_f$  for different values of  $\varphi$
- Figure 7.30: Nusselt Number variation Nu for different values of Nb
- **Figure 7.31:** Nusselt Number variation *Nu* for different values of *R*.
- Figure 7.32: Nusselt Number variation Nu for different values of Nt
- **Figure 7.33:** Nusselt Number variation Nu for different values of  $\varphi$
- **Figure 7.34:** Sherwood Number variation *Sh* for different values of  $R_k$
- Figure 7.35: Sherwood Number variation *Sh* for different values of *Nb*
- Figure 7.36: Sherwood Number variation *Sh* for different values of *Nt*
- Figure 7.37: Sherwood Number variation *Sh* for different values of *Sc*