

Contents

List of Tables	xvii
List of Figures	xix
1 Introduction	1
1.1 Basic equations in Magnetohydrodynamics (MHD)	2
1.2 Boundary Conditions	4
1.2.1 MHD boundary conditions	4
1.3 Hall currents	5
1.4 Porous Medium	7
1.4.1 Porosity	8
1.4.2 Permeability	8
1.4.3 Darcy's Law	8
1.5 Heat Transfer	9
1.5.1 Conduction	9
1.5.2 Convection	10
1.5.3 Radiation	11
1.6 Earlier works relevant to the present investigations	11
1.6.1 Hydromagnetic Couette flow in a rotating system	12
1.6.2 Hall effects on magnetohydrodynamic flow	14
1.6.3 MHD flow through a vertical channel	16
1.6.4 Radiation effect on MHD flow	17
1.6.5 MHD boundary layer flow past a stretching surface	20
1.7 Present Investigation	22

2 Radiation effect on MHD fully developed mixed convection in a vertical channel with asymmetric heating	27
2.1 Introduction	27
2.2 Formulation of the problem and its solutions	30
2.3 Expression for pressure gradient	33
2.4 Results and discussion	34
2.4.1 Velocity profiles and induced magnetic field	34
2.4.2 Temperature profile	38
2.4.3 Shear stresses	39
2.4.4 Limiting case	42
2.5 Conclusion	44
3 Oscillatory MHD Couette flow in a rotating system	45
3.1 Introduction	45
3.2 Mathematical formulation and its solution	46
3.3 Single plate oscillation	53
3.4 Flow under harmonic oscillations of the plate	54
3.5 Results and discussion	54
3.5.1 Primary and secondary velocity profiles	55
3.5.2 Shear stresses	58
3.6 Conclusion	60
4 Hydromagnetic oscillatory reactive flow through a porous channel in rotating frame subject to convective heat exchange under Arrhenius kinetics	63
4.1 Introduction	63
4.2 Formulation of the problem and its solutions	67
4.3 Results and discussion	73
4.3.1 Primary and secondary velocity profiles	73
4.3.2 Temperature profiles	77
4.3.3 Shear stresses	82
4.3.4 Rate of heat transfer	85
4.4 Conclusion	87

5 Layout of Boussinesq couple-stress fluid flow over an exponentially stretching sheet with slip in porous space subject to variable magnetic field	89
5.1 Introduction	89
5.2 Mathematical model	95
5.3 Numerical method for solution	98
5.4 Results and discussion	100
5.4.1 Effects of parameters on velocity profiles	101
5.4.2 Effects of parameters on temperature profiles	103
5.4.3 Effects of parameters on stream function	107
5.4.4 Effects of parameters on shear stress and rate of heat transfer	111
5.5 Conclusion	113
6 Outlining impact of Hall currents on unsteady magneto-convection in a moving channel with Cogley-Vincent-Gilles heat flux model	115
6.1 Introduction	115
6.2 Mathematical model	118
6.2.1 Impulsive motion of right wall	124
6.2.2 Accelerated motion of right wall	125
6.3 Results and discussion	126
6.3.1 Primary and secondary velocity profiles	126
6.3.2 Temperature profiles	135
6.3.3 Shear stresses	137
6.3.4 Rate of heat transfer	143
6.4 Conclusion	145
7 Hall effects on unsteady MHD reactive flow through a porous channel with convective heating under Arrhenius reaction rate	147
7.1 Introduction	147
7.2 Mathematical Formulation	149
7.2.1 When the upper plate is set into impulsive motion	154
7.2.2 When the upper plate starts to move with uniform acceleration	154
7.3 Results and discussion	155

7.3.1	Parameter effects on the primary and secondary velocity profiles	155
7.3.2	Parameter effects on the shear stresses	160
7.3.3	Heat Transfer	163
7.3.4	Parameter effects on the temperature profiles	165
7.3.5	Parameter effects on the rate of heat transfer	167
7.4	Conclusion	169
8	Conclusion and suggestion for future work	171
	Bibliography	177
	List of publications	213