Chapter 8

Results and Discussion

This chapter presents a summary of results obtained in previous chapters.

In chapter 2, the fundamental differential equations for a rotating thermo elastic medium with in framework of Lord-Shulman thermoelasticity are formulated and solved to get velocity equation. The reflection of coupled plane wave subjected to impedance boundary conditions is studied to get ratios of amplitude and energy ratios of all waves reflected in the medium. Aluminium-epoxy composite is taken for numerical evaluation and to study the change in the energy ratios $|E_1|$, $|E_2|$ and $|E_3|$ of reflected P1, P2 and P3 waves and variations versus incident angle of P1 wave when $\Omega = 10$. (Blue curve-$Z_1^* = 10, Z_2^* = 10$; Black curve-$Z_1^* = 0, Z_2^* = 0$; Red curve-$Z_1^* = - 10, Z_2^* = - 10$) is shown in Figures 2.2(a) to 2.2(c). The variations of $|E_1|$, $|E_2|$ and $|E_3|$ versus the rotation parameter $\Omega$ when $\theta_0 = 45^\circ$. (Blue curve-$Z_1^* = 10, Z_2^* = 10$; Black curve-$Z_1^* = 0, Z_2^* = 0$; Red curve-$Z_1^* = - 10, Z_2^* = - 10$) is shown in Figures 2.3(a) to 2.3(c). The amount of change of $|E_1|$, $|E_2|$ and $|E_3|$ against the impedance parameter $Z_1^*$ when $Z_2^* = 0$ and $\theta_0 = 45^\circ$ (Solid curve-$\Omega = 2$; Solid curve with star-$\Omega = 10$; Solid curve with square-$\Omega = 50$) is shown in Figures 2.4(a) to 2.4(c). The change of $|E_1|$, $|E_2|$ and $|E_3|$ against the impedance parameter $Z_2^*$ when $Z_1^* = 0$ and $\theta_0 = 45^\circ$ (Solid curve-$\Omega = 2$; Solid curve with star-$\Omega = 10$; Solid curve with square-$\Omega = 50$) is shown in Figures 2.5(a) to 2.5(c). The amount of change of $|E_1|$, $|E_2|$ and $|E_3|$ against incident angle for thermally insulated case (solid curves) and isothermal case (dotted curves), when $Z_1^* = - 10, Z_2^* = - 10$ and $\Omega = 10$ is shown in Figures 2.6(a) to 2.6(c).

In chapter 3, velocity equation for a rotating monoclinic magneto-thermo-elastic medium is formulated and solved to get $q_P$, $q_{SV}$ and $q_T$ waves speed. The real velocities of above said waves are calculated for specific material modelling the half-plane. The change in speeds of plane waves $q_P$, $q_{SV}$ and $q_T$ versus the incident angle ($\theta$) varying from $0^\circ$ to $90^\circ$ when magnetic field $H_0 = 10$ and rotation-frequency ratio $\Omega/\omega = 0, 2, 10$ is depicted in Figures 3.1(a) to 3.1(c). The amount of change of speeds of plane waves $q_P$, $q_{SV}$ and $q_T$ waves versus the incident angle ($\theta$) varying from $0^\circ$ to $90^\circ$ when rotation-frequency ratio $\Omega/\omega = 2$ and magnetic field $H_0 = 0, 10, 20$ is shown in Figures 3.2(a) to 3.2(c). The change of speeds of plane waves $q_P$, $q_{SV}$ and $q_T$ waves versus $H_0$ varying from 0 to 50 for angle of incidence $\theta = 45^\circ$ and
Ω/ω = 0, 4 and 8 is depicted in Figures 3.3(a) to 3.3(c). The amount of change of speeds of plane waves qP, qSV and qT waves versus the reflected angle (θ) varying from 0° to 90° when magnetic field H₀ = 10 and rotation-frequency ratio Ω/ω = 0, 2, 10 is shown in Figures 3.4(a) to 3.4(c). The change of speeds of plane waves qP, qSV and qT waves versus the rotation Ω varying from 4 to 20 when angle of reflection (θ) is 45°, angular frequency ω = 2 Hz and magnetic field H₀ = 0, 10, 20 is depicted in Figures 3.5(a) to 3.5(c).

In chapter 4, with in framework of Lord-Shulman Model of thermoelasticity, the velocity equation for a micropolar thermoelasticity with diffusion is formulated. The speed of these plane waves are calculated for a given material and changes in the speeds of plane waves versus diffusion parameter D, b, a, thermal conductivity K and frequency ω are depicted graphically. The change of speeds of CLD, CT and CMD waves against diffusion parameter D varying from 0.0 to 1.0 are depicted by black, blue and red lines respectively in Figure 4.1. The change of speeds of CLD, CT and CMD waves against diffusion parameter b varying from 0.0 to 1.0 are depicted by black, blue and red lines respectively in Figure 4.2. The change of speeds of CLD, CT and CMD waves against diffusion parameter a varying from 0.0 to 0.5 are depicted by black, blue and red lines respectively in Figure 4.3. The change of speeds of CLD, CT and CMD waves against thermal conductivity K varying from 0.0 to 1.0 are depicted by black, blue and red lines respectively in Figure 4.4. The change of speeds of CLD, CT and CMD waves against frequency ω varying from 0 to 20 are depicted by black, blue and red lines respectively in Figure 4.5.

In chapter 5, Reflection of coupled longitudinal displacement wave (CLD) for thermally insulated and isothermal traction free surface is investigated to obtain ratios of amplitude $|Z_s|^s (s = 1,2,...,5)$ and energy ratios $|E_s|^s (s = 1,2,...,5)$ of CLD, CT, CMD, CTD and CTM waves reflected micropolar thermoelastic half plane with diffusion respectively. $|Z_s|^s (s = 1,2,...,5)$ are calculated for a certain material and the amount of change of reflection coefficients against the incident angle and against the diffusion parameters D and a, are studied graphically. $|E_s|^s (s = 1,2,...,5)$ are also calculated for a certain material and plotted against the incident angle. The change in reflection coefficient $|Z_s|^s (s = 1,2,...,5)$ against incident angle for thermally insulated case and isothermal case is shown in Figures 5.2(a) to 5.2(e). The solid and dotted curves in Figures 5.2(a) to 5.2(e) correspond to thermally isolated and isothermal cases, respectively. Comparing the solid curves with the dotted curves, a significant effect of boundary
surface is observed on reflection coefficients $|Z'_s|$, $(s=1,2,...,5)$ of reflected waves and changes with the change in incident angle. The amount of change of $|Z'_s|$, $(s=1,2,...,5)$ of all reflected waves against the diffusion parameter $D$ and $a$ for thermally insulated case are depicted in Figure 5.3 and against diffusion parameter $a$ in Figure 5.4. From Figures 5.3 and 5.4, it is viewed that the reflection coefficients $|Z'_s|$, $(s=1,2,...,5)$ of each reflected wave change with the change in diffusion parameters $D$ and $a$.

The comparison of $|E_i|$, $(s=1,2,...,5)$ against incident angle for thermally insulated case is depicted in Figure 5.5. It is observed from Figure 5.5 that the $|E_i|$, $(s=1,2,...,5)$ of the reflected waves change with the change in incident angle of wave.

In chapter 6, the velocity equation for a micropolar thermoelastic medium is formulated with in framework of Lord-Shulman thermoelasticity for plane waves. The reflection of plane wave subjected to impedance boundary conditions is studied to get ratios of amplitude $|R_i|$, $(i=1,2,..,4)$ and the energy ratios $|E_i|$, $(s=1,2,..,4)$ of reflected CLD, CT, CTD and CTM waves for incident CLD wave. Aluminium-epoxy composite is taken for numerical computation for ratios of amplitude $|R_i|$, $(i=1,2,..,4)$ and the energy ratios $|E_i|$, $(s=1,2,..,4)$. Amount of change of energy ratios against the incident angle and against impedance parameters are studied graphically. Variations of $|E_s|$, $(s=1,2,..,4)$ of all waves reflected in the medium versus the incident angle $\theta_o$ of CLD wave varying from $0^\circ$ to $90^\circ$ for three different sets of impedance parameters i.e. $(Z_1 = Z_2 = Z_3 = 0,10,50)$, are shown in Figures 6.2(a) to 6.2(d). Variations of $|E_s|$, $(s=1,2,..,4)$ against the impedance parameter $Z_1$ when $\theta_o = 45^\circ$ for three different sets of impedance parameters i.e. $(Z_2 = Z_3 = 0)$, $(Z_2 = Z_3 = 10)$, $(Z_2 = Z_3 = 50)$ are shown in Figures 6.3(a) to 6.3(d). Variations of $|E_s|$, $(s=1,2,..,4)$ against the impedance parameter $Z_2$ when $\theta_o = 45^\circ$ for three different sets of impedance parameters i.e. $(Z_1 = Z_3 = 0)$, $(Z_1 = Z_3 = 10)$, $(Z_1 = Z_3 = 50)$ are shown in Figures 6.4(a) to 6.4(d). Variations of $|E_s|$, $(s=1,2,..,4)$ against the impedance parameter $Z_3$ when $\theta_o = 45^\circ$ for three different sets of impedance parameters i.e. $(Z_1 = Z_2 = 0)$, $(Z_1 = Z_2 = 10)$, $(Z_1 = Z_2 = 50)$ are shown in Figures 6.5(a) to 6.5(d).

In chapter 7, velocity equation for generalised thermo-microstretch elasticity with diffusion is obtained and solved with in framework of Lord-Shulman theory of thermoelasticity
and velocities $V_1$, $V_2$, $V_3$ and $V_4$ of reflected CLD1, CLD2, CLD3, CLD4, and $V_5$ and $V_6$ of reflected CTD and CTM waves are obtained. Aluminium-epoxy composite is taken for numerical computation and variations in wave speed against frequency $\omega$ and diffusion parameter $D$ is studied graphically. The variations of speeds of CLD1, CLD2, CLD3 and CLD4 waves against frequency $\omega = 0.0$ Hz to $\omega = 25$ Hz. are shown in Figure 7.2. The variations of speeds of CLD1, CLD2, CLD3 and CLD4 waves against diffusion parameter $D = 0$ to $D = 1.0$ are shown in Figure 7.3. The interpretations between ratios of amplitude and energy ratios for a traction free thermally insulated boundary are derived. Energy ratios $|E_s|$, ($s = 1, 2, ..., 6$) of reflected waves are calculated for aluminium-epoxy composite material and variation of energy ratios against the incident angle is studied graphically. The variations of $|E_s|$, ($s = 1, 2, ..., 6$) of reflected CLD1, CLD2, CLD3 CLD4, CTD and CTM wave versus incident angle of CLD1 wave varying from $0^\circ$ to $90^\circ$ when $D = 0.1$, 0.5 and 0.9 are shown graphically in Figure 7.4 to 7.9.