Chapter 8

Conclusion

In the present research work, the problems of reflection and transmission of a plane SH-wave at a corrugated interface between two elastic solid half-spaces with different elastic properties are studied. Rayleigh's method of approximation is used to find out the formulae of the reflection and transmission coefficients for the first order approximation of the corrugation. The expressions for the reflection and transmission coefficients for the second order approximation of the corrugation and energy partition relation are also derived in some problems. In a special case, a simple cosine interface is considered and the solutions for the first/ second order approximation of the corrugation for the reflection and transmission coefficients are obtained. These coefficients are found to be significantly affected by the amplitude of the corrugated interface, the elastic properties of the half-spaces, the angle of incidence and by the frequency parameter of the incident wave.

It is concluded that the reflection and transmission coefficients for the first and the second order approximation of the corrugation are proportional to the amplitude of the corrugated interface. The variations of all the coefficients are computed numerically and depicted graphically for a particular model and effects of corrugation parameter is examined. If we neglect the amplitude of the corrugated interface, then it is easy to see that all the coefficients corresponding to the first/ second order approximation of the corrugation vanish and we are left with only the reflection and transmission coefficients at the plane interface. The chapter wise conclusion of the present research work is summarized as follows

In Chapter 2, the analytical expressions of the reflection and transmission coefficients for the first order approximation of the corrugation are derived when a plane

SH-wave is incident obliquely at a corrugated interface between two laterally and vertically heterogeneous transversely isotropic elastic solid half spaces. The lateral heterogeneity is considered to be the same in both the half-spaces. These coefficients are found to be affected by the lateral and vertical heterogeneities of both the half-spaces. The effect is found to be least near normal incidence, when the half-space containing the incident wave, is homogeneous and anisotropic (transversely isotropic). When both the half-spaces are anisotropic and heterogeneous, these coefficients are found to be influenced by the frequency parameter of the incident wave. For higher values of frequency parameter, the values of the reflection and transmission coefficients at the plane interface remain almost constant, whereas these coefficients at the corrugated interface increase linearly with increase of the frequency parameter, but at different rates. If only the vertical heterogeneity is present in the half-space containing the incident wave, and the other half-space is homogeneous and anisotropic, then the values of the reflection coefficient at the plane interface increase, while the values of the transmission coefficient at the plane interface decrease, with the angle of incidence. On the other hand, in general, the remaining coefficients decrease, first slowly and then rapidly, with the angle of incidence. The presence of the lateral heterogeneity in the half-spaces do not allow these coefficients to occur beyond 60^0 angle of incidence.

In Chapter 3, we have considered a problem when a plane SH-wave is incident obliquely at a corrugated interface between two different monoclinic elastic half-spaces. Numerical results reveal that the reflection and transmission coefficients at both the plane and the corrugated interfaces are found to be strongly influenced by the crystalline (anisotropy) nature of the half-spaces. It is noticed that the effect of the frequency parameter on these coefficients is remarkable at normal and grazing incidences. These coefficients are significantly different when one of the half-spaces is monoclinic, whereas the other half-space is isotropic elastic.

In Chapter 4, we have considered a problem of reflection and refraction of SH-wave incident obliquely at a corrugated interface between two laterally and vertically heterogeneous viscoelastic solid half spaces. A remarkable effect of lateral and vertical heterogeneities on the reflection and transmission coefficients for the first order approximation of the corrugation is found. These coefficients increase with increase of the lateral heterogeneity. It is evident from the numerical results that when both the media are viscoelastic and heterogeneous, the values of these coefficients are found to be influenced by the frequency parameter of the incident wave. The reflection and transmission coefficients for the first order approximation of the corrugation are significantly affected by the angle between the propagation and attenuation vectors. In general, each amplitude ratio decreases with the increase of the angle of incidence at each value of the angle between propagation and attenuation vectors.

In Chapter 5, we have considered a problem of reflection and refraction of SH- wave at a corrugated interface between a laterally and vertically heterogeneous anisotropic elastic half-space and a heterogeneous isotropic viscoelastic solid half space. It is evident from the numerical results that when both the half spaces are heterogeneous, the reflection and refraction coefficients for the first order approximation of the corrugation are found to be influenced by the anisotropy parameter of the solid half space and by the frequency parameter of the incident wave. These coefficients are also significantly affected by the angle between propagation and attenuation vectors. Each coefficient, except the reflection coefficient at the plane interface, decreases with the increase of the angle of incidence. It is found that at 45^0 angle of incidence, all the coefficients for the first order approximation of corrugation have their maximum values when the angle between propagation and attenuation vectors is near 72^0.

In Chapter 6, the formulae for the reflection and transmission coefficients are obtained in closed form, when a plane SH-wave is incident at a corrugated interface between a dry sandy half-space and an anisotropic elastic solid half space. From these formulae and the numerical results, we have noticed that the reflection and transmission coefficients strongly depend upon sandy material parameter, the anisotropy, the frequency and the angle of the incident wave. The effect of the sandy parameter is found to be least near normal incidence. However, different critical angles occur for different values of the sandy parameter. Reflection and transmission coefficients are found to be influenced by the frequency parameter of the incident wave. The values of each of the coefficients at the corrugated interface decrease with the angle of incidence and increase with the frequency parameter. There is a significant effect of the density and the anisotropy of the half-space on each coefficient, whether on the plane interface or on the corrugated interface. The reflection coefficient at the corrugated interface for the first order approximation of the corrugation decrease with the increase of the anisotropy and the angle of incidence, whereas the refraction coefficient at the corrugated interface decrease with the angle of incidence and increase with the anisotropy parameter. With the increase of sandiness parameter of the half-space, the values of the energy ratios of various reflected waves increase, while that of the refracted wave decrease.

In Chapter 7, we have considered a problem, when a plane SH-wave is incident at a corrugated interface between an initially stressed slow elastic half-space lying over an anisotropic elastic solid half-space. All these coefficients, whether at the plane interface or at the corrugated interface, attain their maximum values when the wave is incident normally and then decrease with increase of the sandy parameter. With the increase of the value of the sandy parameter in the half-space, the values of the energy ratios of reflected wave increase, while that of the refracted wave decrease.