Abstract

In this thesis, we studied the nonlinear ion-acoustic waves in a magnetized plasma in which two types of inertialess electrons, cold and hot, and inertial ions are present. The cold electrons are considered Boltzmannian whereas hot electrons follow (r, q) distribution. First, we derived the Korteweg de-Vries-Zakharov Kuznetsov (KdV-ZK) equation, then modified Korteweg de-Vries-Zakharov Kuznetsov (mKdV-ZK) equation and at the end we derived the extended Zakharov Kuznetsov (EZK) equation by coupling the KdV-ZK and mKdV-Zk equations. The EZK equation has two types of nonlinearities, the 2^{nd} order nonlinearity present in the KdV-ZK equation and 3^{rd} order nonlinearity present in mKdV-ZK equation. We then plot the shock as well as soliton solutions of EZK for various values of parameters and spectral indices q and r. We found that shock strength and steepness increase with the increase in negative values of r but decrease with the increase of values of q. For solitons, soliton width and amplitude increase with the increase of negative values of r, but almost remain the same for changes in the values of q. Both the shock amplitude and soliton amplitude increase with the increase in velocity of nonlinear structure, linear phase velocity and cold electron density.