Eucalyptus plantations are an important source of raw material for the forest products industry in Turkey. Despite its economic and ecological value, there is little reference information regarding growth and yield of eucalyptus plantations. Thus, a segmented compatible stem taper and merchantable tree volume equation system was developed for Eucalyptus plantations in East Mediterranean Region of Turkey. Data used in this study come from 190 eucalyptus grandis (EG) and 149 eucalyptus camaldulensis (EC) destructively sampled from even-aged plantations. The systems of equations were fitted by the simultaneous estimation of parameters by the maximum likelihood with full information estimation method (FIML) to optimize fitting while simultaneously minimizing the errors in a combined way. The equation systems produced similar results for the two species analyzed in this study. Based on the overall fit statistics, taper and volume equations showed consistent performance for different sections of stem using relative height classes, different tree height, and diameter classes in estimating stem diameter and merchantable volume, respectively. Differences of the taper equations among eucalyptus species were examined and tested using the $F$-test. The result of $F$-test indicated differences in species-specific taper equations for EG and EC species. A different taper equation should therefore be used for each eucalyptus species. The segmented taper and merchantable stem volume equations can help forest managers to estimate the stem diameter and volumes of standing trees of both eucalyptus species, which is important in practical forestry applications.