Fast neutron fluence and absorbed dose distribution from Am-Be neutron source has been measured inside water phantom using cellulose nitrate (LR-115) solid state nuclear track detector (SSNTD). The absorbed doses calculated using fluence –Kerma Conversion factors have been compared with those calculated by using fast neutron scattering cross sections for Hydrogen and Oxygen. The relaxation length and build up factors have been measured. An empirical formula was proposed for depth dose calculations. Dose equivalent as well as effective dose in each of the various human body tissues are extracted by weighting the measured dose according to the International Commission of Radiological Protection (ICRP) latest published weighting factors.