The study intends to investigate the large amplitude vibration of functionally graded material (FGM) orthotropic cylindrical shells interacting with the nonlinear Winkler elastic foundation in the framework of the Donnell’s shell theory. To derivation of basic equations of FGM orthotropic cylindrical shells interacting with the nonlinear elastic foundation is used von-Karman type geometric nonlinearity. The superposition and Galerkin methods are used to convert the above equations into a nonlinear ordinary differential equation. The frequency-amplitude characteristics of functionally graded (FG) orthotropic cylindrical shell interacting with the nonlinear elastic foundation are obtained using the semi-inverse method. The accuracy of the current study is verified by comparing it other solutions available in the literature. Moreover, some new results are also presented for the nonlinear frequency parameters of the cylindrical shells to study the effects of the nonlinear elastic foundation, vibration amplitude, FG orthotropic profiles and shell characteristics. (C) 2016 Elsevier Ltd. All rights reserved.