## ABSTRACT

In the present research, non-linear dynamical stability analysis of imperfect orthotropic functionally graded materials simply-supported toroidal shell segments subjected to an axial compression rate with taking into accounts the damping force are presented analytically.

The mechanical properties assumed to be graded continuously and smoothly through the thickness direction of shells segments according to the exponential distribution function of the volume fraction of constituent materials.

Grounded on the shear deformation theory (SDT) and the Von Karman-type, Stein and McElman hypothesis and through Hamilton principle, the basic governing equations for the dynamical stability behavior are obtained for the TSSs models. Thereafter, by employing the Galerkin's method with stress function, the achieved nonlinear differential equation is solved by means of Runge Kutta 4th order method. The results of the proposed research are compared with the results of the published literature which showed an excellent matching with the present results. Further, the impacts of several parameters such as geometrical factors, different compression rates, imperfections, damping ratios, and different non-homogeneous factors on non-linear dynamical stability response of imperfection E-FGM orthotropic toroidal shells segments are investigated in details.

Additionally, it is apparent that increasing axial velocities leads to an increase in the critical dynamical buckling loads and the vibration amplitude, meanwhile reducing the critical time of the buckling. The damping ratios have a significant impact on the non-linear dynamical buckling response, especially in the first period of vibration, whereas after that the vibration amplitude of shells remains almost the same for various damping ratios of both convex and concave toroidal shell segments. Moreover, the critical dynamical buckling loads of convex shells are always greater than those of concave shells at the same conditions.