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EXPLICIT PARAMETERIZATIONS OF NON-BENDING TORUS-LIKE SURFACES

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Abstract. A special class of toroidal-like shells of revolution which when loaded symmetrically in their equilibrium state deform without bending is considered. Here we present their explicit parameterizations in terms of elliptic integrals.

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1. Introduction

The present paper is a result of our continuing interest in the shapes of thin-walled shells having the property of deforming without bending. The phrase "deforming without bending" means that the normal at each point of the shell under deformation retains its direction. Surfaces of such shapes in the context of the shell theory are called *non-bending surfaces*.

Recently we have described and classified a variety of *non-bending surfaces of revolution*, which explicit parameterizations have been represented in terms of normal elliptic integrals and Jacobian elliptic functions [13–15] . The non-bending surfaces that we have obtained (see [15]) constitute a three parametric family of *Weingarten surfaces of revolution*, whose meridional κ_μ and parallel κ_π principal curvatures obey a specific quadratic relationship

$$\kappa_\mu = \frac{2ac}{\alpha a + c}\kappa_\pi^2 - \frac{\alpha a - 3c}{\alpha a + c}\kappa_\pi - \frac{2\alpha}{\alpha a + c} \tag{1}$$