CAD Problem Progress Report

Team Members:-
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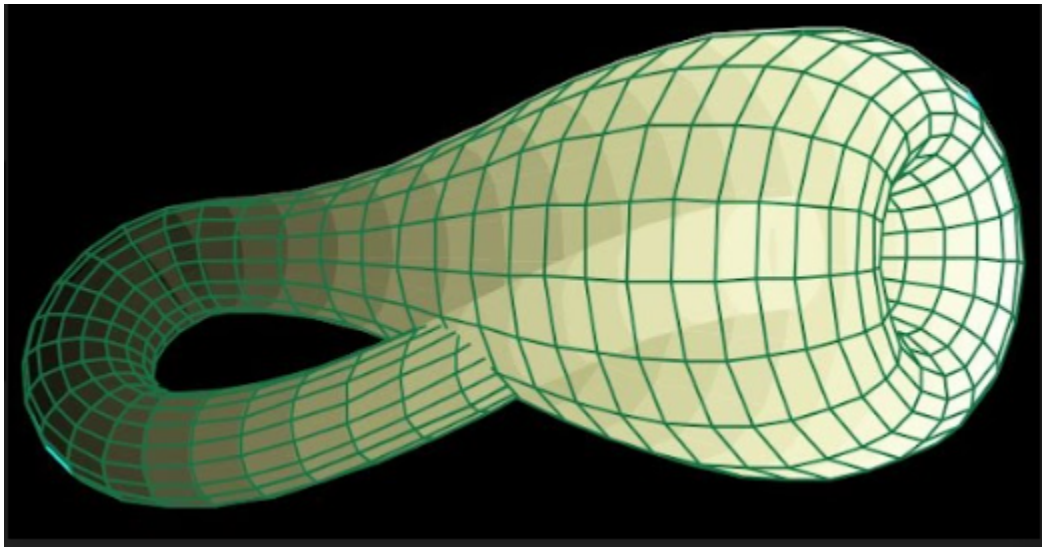
Problem Statement:- Make the CAD Model for the following(Link)



Approach

This is a Klein bottle which is a 1-surface 3D body(True Klein bottle lives in 4D) in order to make this. First we have to keep one thing in mind: we are dealing with surfaces not solid bodies. We will use curve tools like spline to create a basic outline of one longitudinal element and then revolve it around the center line or axis to get a surface - Surface 1 (Revolved Surfaces) using the revolved boss/base feature.

After obtaining the revolved Surface 1, a semi-circle connected is sketched and connected with another cubic spline which is constructed to generate the curved intersecting body (Body 1) with the Surface 1. Firstly, the sweep cut feature is used to create the opening for the curved intersecting body in the revolved surface (Surface 1).

The curved intersecting body (Body 1) is then generated by using swept boss/base feature, which is used to fill material along a specified trajectory/path.

The empty portion between the top surface of Body 1 and Surface 1 is filled using the lofted boss/base feature which is used to fill the open space between two surfaces (Surface 1 and Top surface of Body1). Tangent continuity and curvature continuity conditions are applied at the ends of the surfaces to ensure smoothness of the filler curve generated.

Next, we have to ensure that the small tube which re-enters is also stitched to make it one completely closed surface. For the final step which is to make the opening of the model, the edge of the bottom surface of Body 1 and bottom edge of Surface 1 is filled using a lofted boss/base feature. Tangent continuity and curvature continuity conditions are applied at the ends of the surfaces to ensure smoothness of the filler curve generated.

Several parts are required to make it one single object and to make them appear one keeps in mind that tangents are aligned properly to avoid any unwanted bumps.

Results

We have also made drawings of the top, front, side and sectional views for better visualization.
GitHub Repository Link:- Link

Contribution:-
Model - Nilesh, Nikhil Gangwar, Kunj Golwala
Report - Nilesh, Nikhil Gangwar, Kunj Golwala