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S J C Institute of Technology, Chickballapur

DEPARTMENT OF AERONAUTICAL ENGINEERING

MINI PROJECT

ON

"Modelling of 2D Incompressible And Inviscid Flow Over A Cylinder Of 10cm Diameter And Plotting of Pressure Distribution And Velocity Vector For Subsonic Mach Number "

Subject code:18AE72

Subject: COMPUTATIONAL FLUID DYNAMICS

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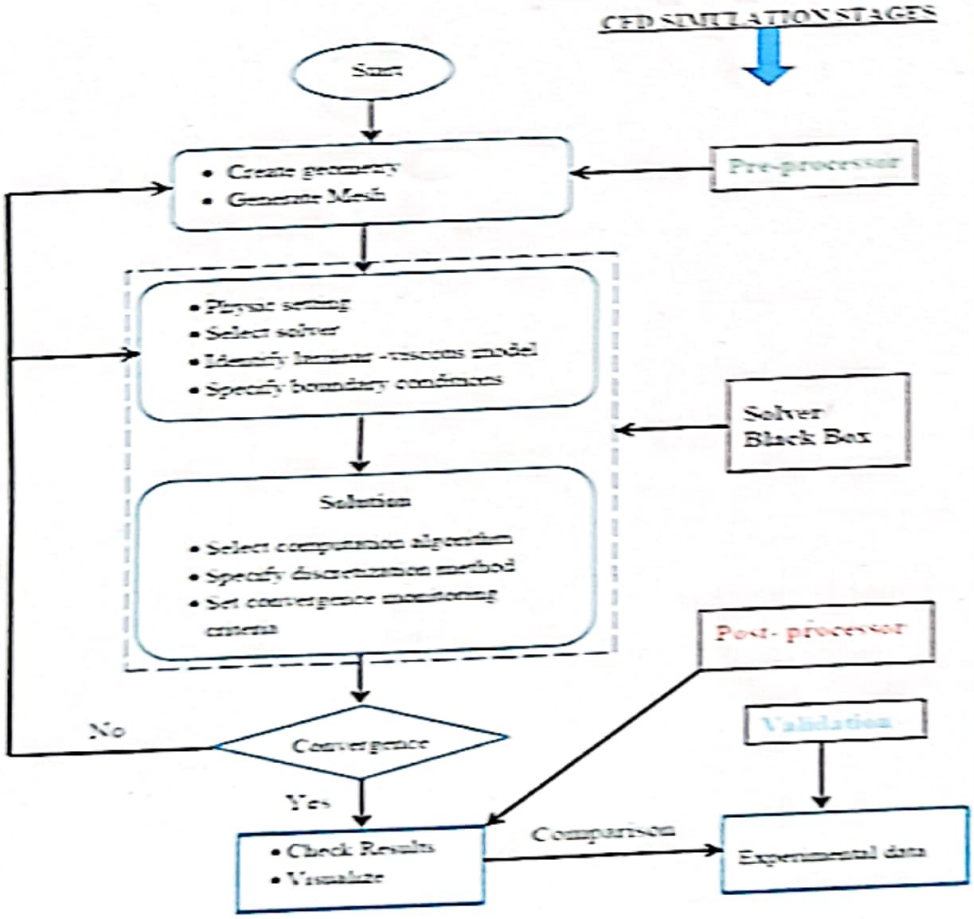
INTRODUCTION:

- Computational fluid dynamics (CFD) is a branch of fluid mechanics that uses numerical analysis and data structures to analyse and solve problems that involve fluid flows.
- Computation fluid dynamics (CFD) is an engineering tool used to simulate the action of thermo-fluids in a system. It is used by many industries in their development work to analyse, optimise and verify the performance of designs before costly prototypes and physical tests.
- By applying CFD, even complex problems can be solved using a numerical iteration process. A commonly used method involves the Navier–Stokes equations which represent a system of equations for continuity, impulse and energy conservation of a fluid.
- Engineering fields where CFD analyses are frequently used are for example aerodynamics and hydrodynamics, where quantities such as lift and drag or field properties as pressures and velocities are obtained. Fluid dynamics is involved with physical laws in the form of partial differential equations.

METHODOLOGY



PRE-PROCESSING

Geometry:

1. Modeling a Cylinder in ANSYS using Design-Modular.
2. Creating in the 2-Dimensional.
3. Give the dimensions for the Cylinder i.e, Diameter of the Cylinder is 10cm
4. Create a boundary for the Cylinder as shown below.

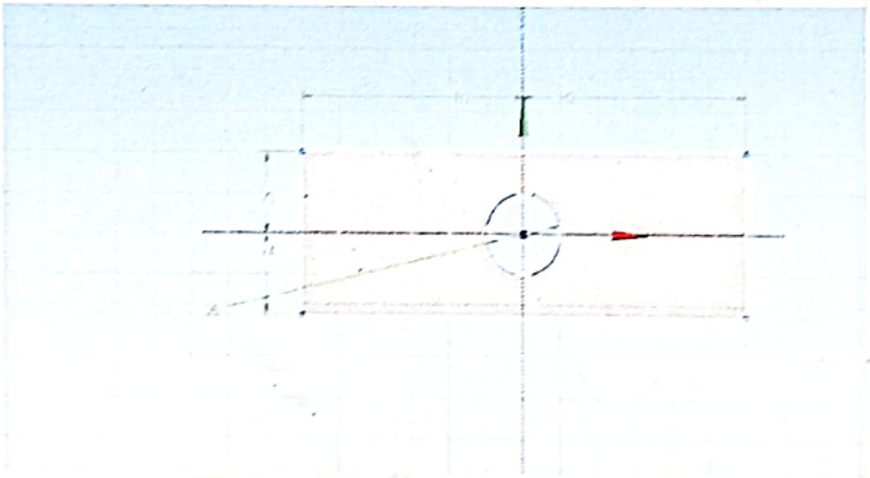


Fig 1. Geometry

imensions: 5	
D5	10 cm
H1	30 cm
H2	30 cm
V3	10 cm
V4	10 cm

Fig .2 Dimensions

MESHING :

1. Now Mesh the geometry which is been created.
2. By doing meshing we will get accurate result.
3. In this meshing is been done with Triangle shape.
4. And fine meshing is been given.

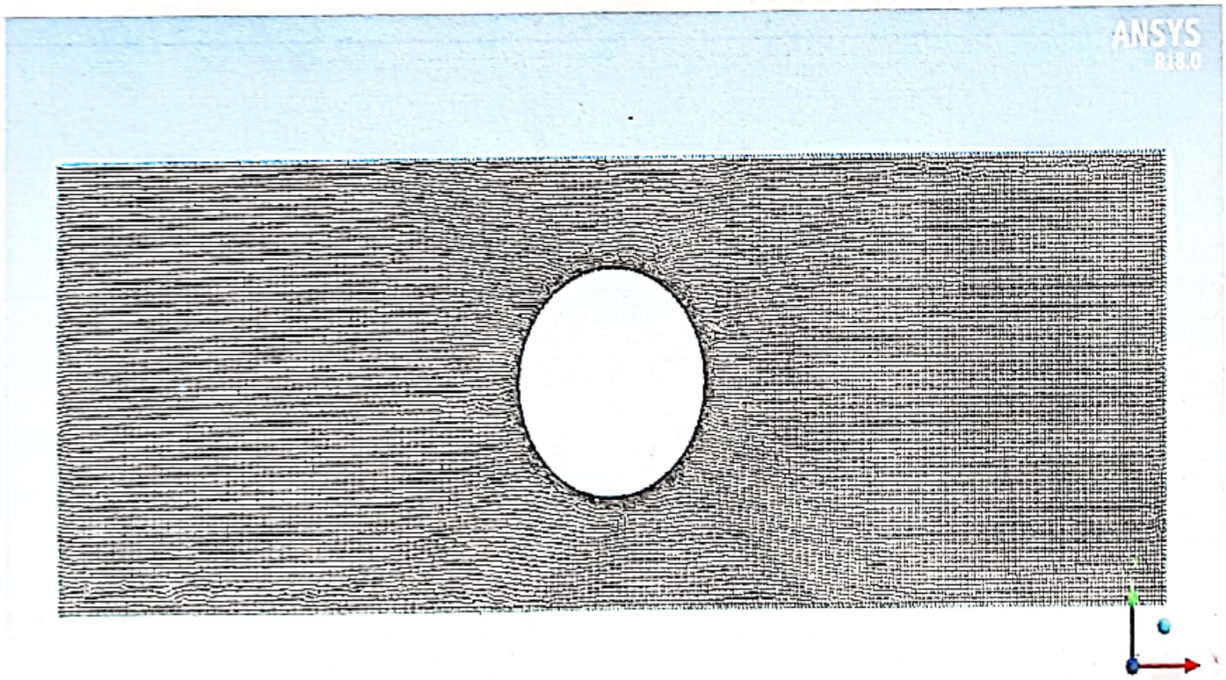


FIG.3 meshing

Nodes	37556
Elements	37011

SKEWNESS OF CYLINDER:

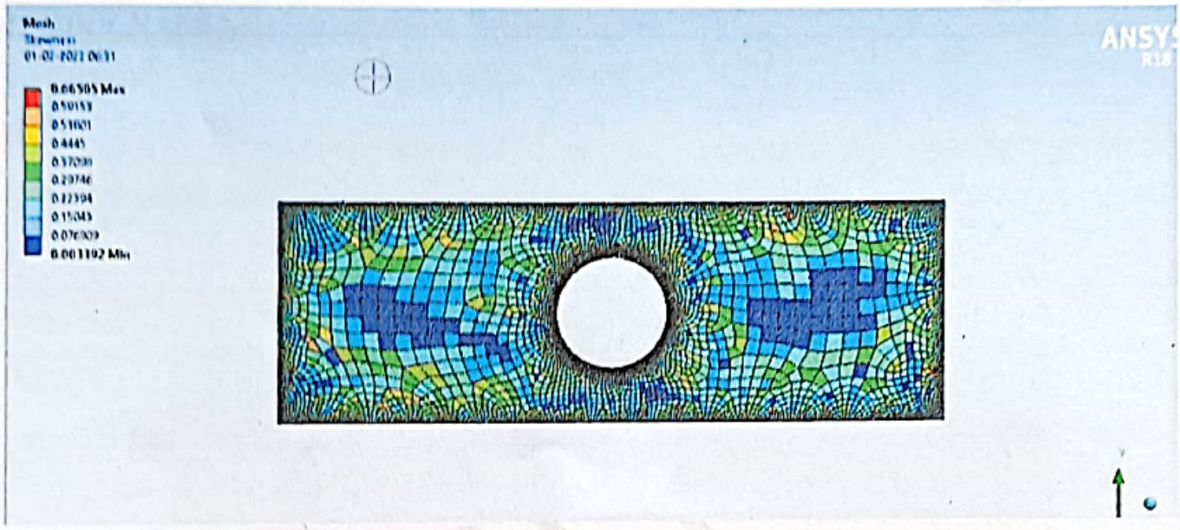


Fig 4

Skewness Ratio	0.003392-0.66050

ORTHOGONALITY QUALITY :

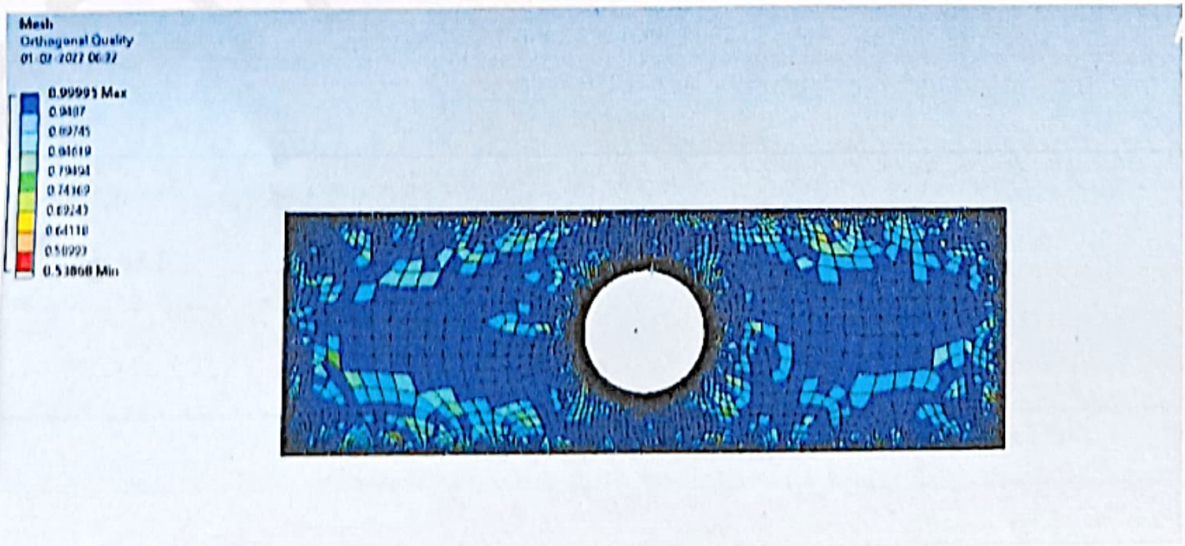


Fig .5

Orthogonal Quality	0.538-0.9995

BOUNDRY NAMING:

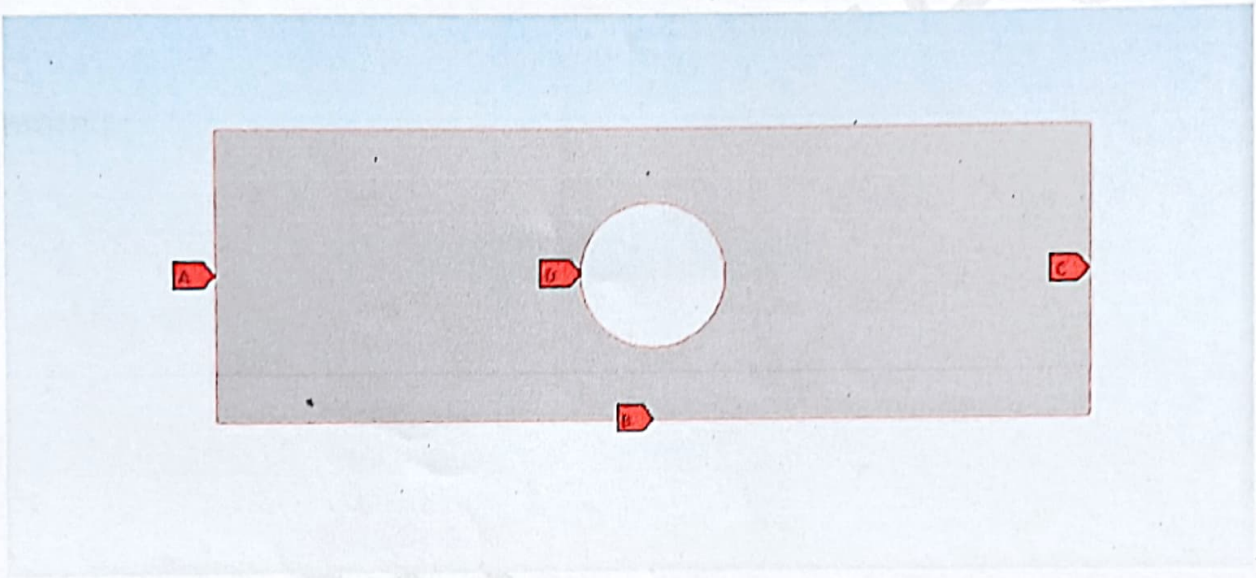
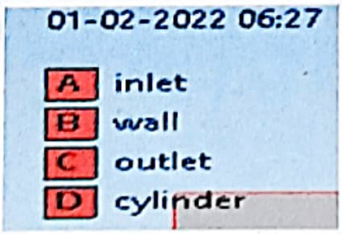
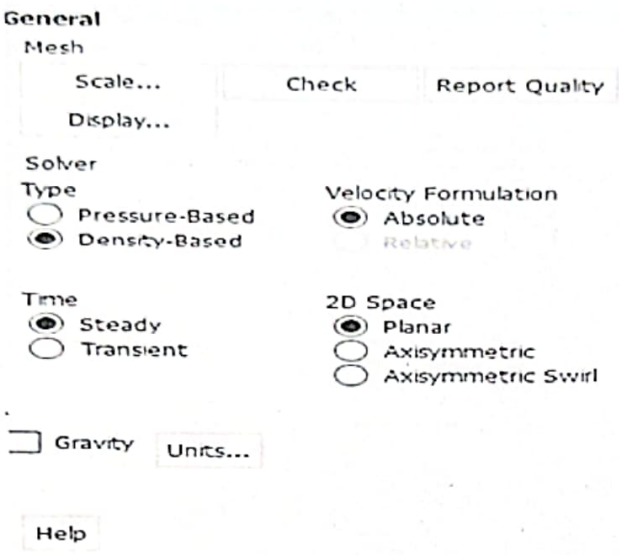


Fig.6

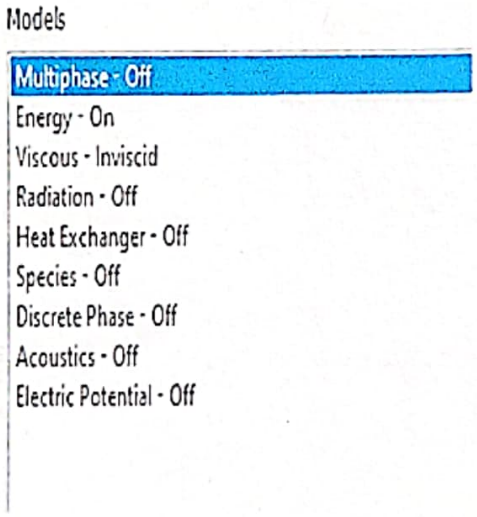


SOLVER:

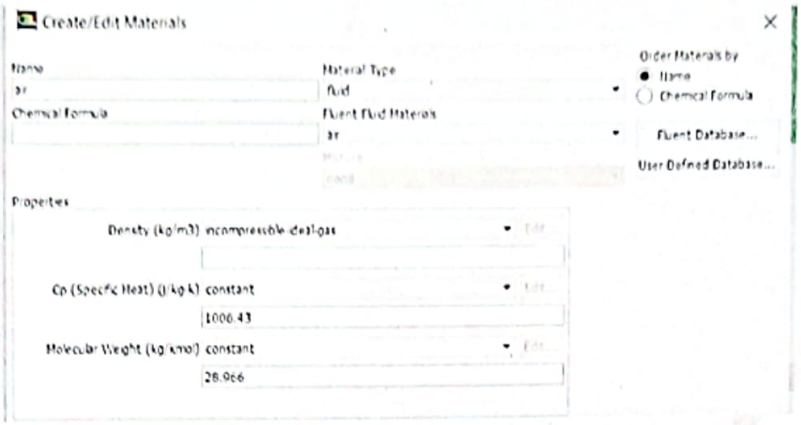
GENERAL;



MODEL:

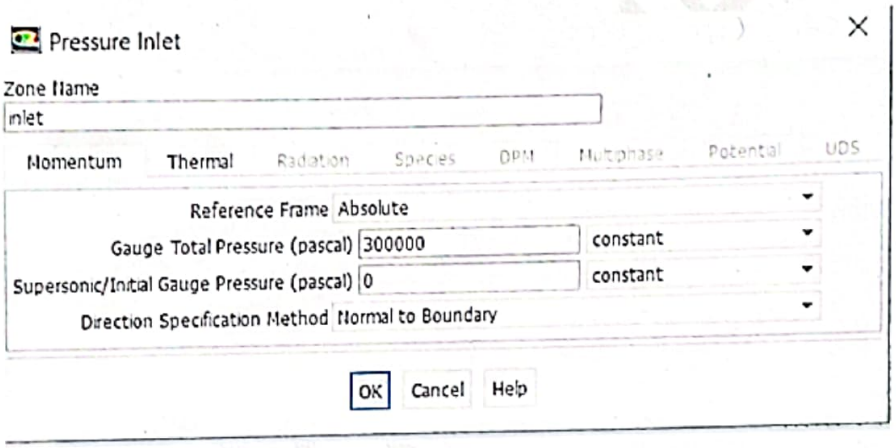


MATERIAL TYPE:

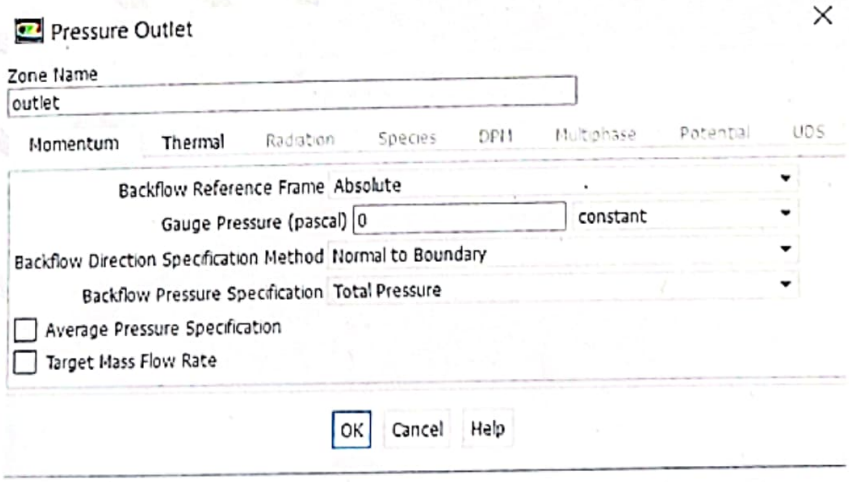


BOUNDRY CONDITIONS:

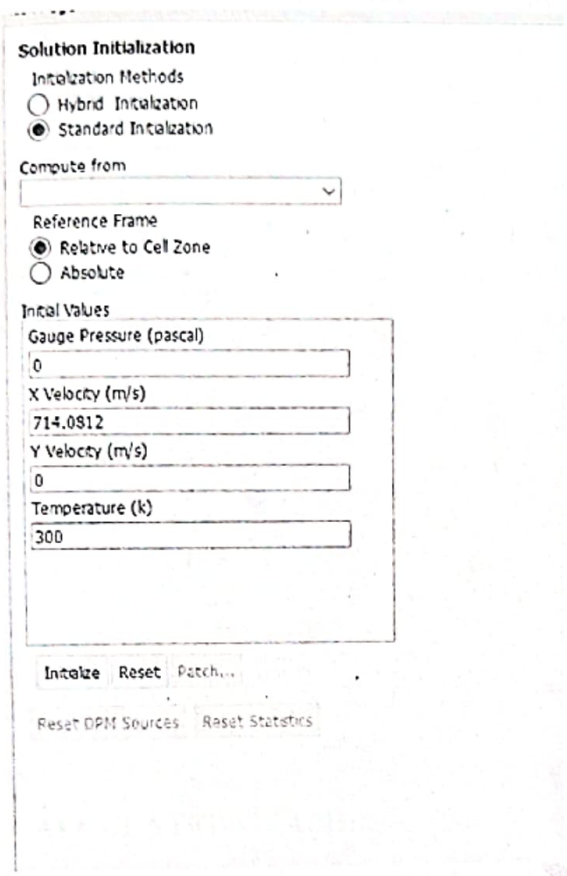
INLET:



OUTLET:



SOLUTION INITIALIZATION :



RUN CALUCULATION:

Run Calculation

Check Case... Update Dynamic Mesh...

Number of Iterations 2000

Reporting Interval 1000

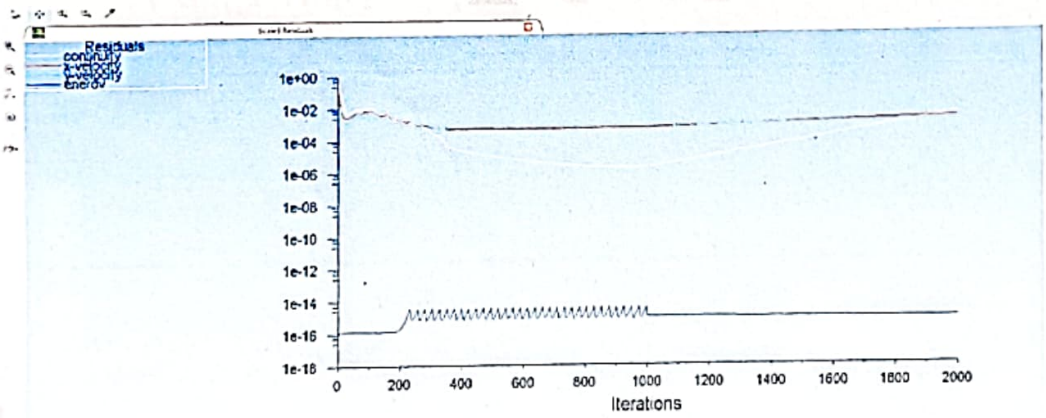
Profile Update Interval 1

Data File Quantities... Acoustic Signals...

Calculate

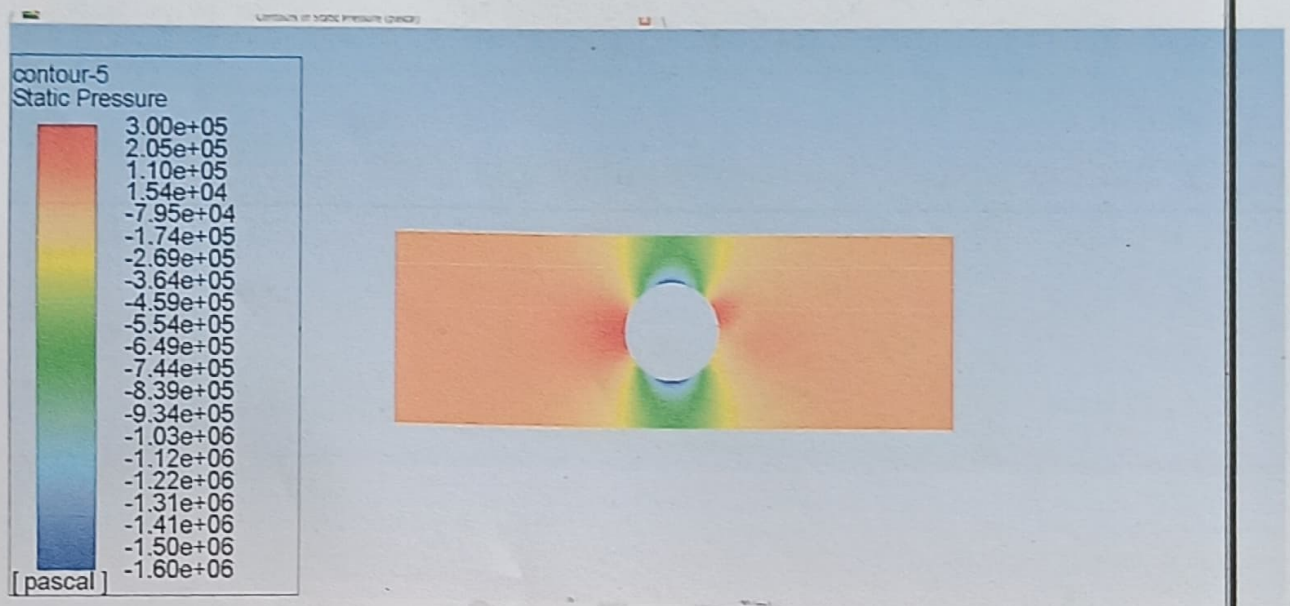
Help

CALCULATED GRAPH:

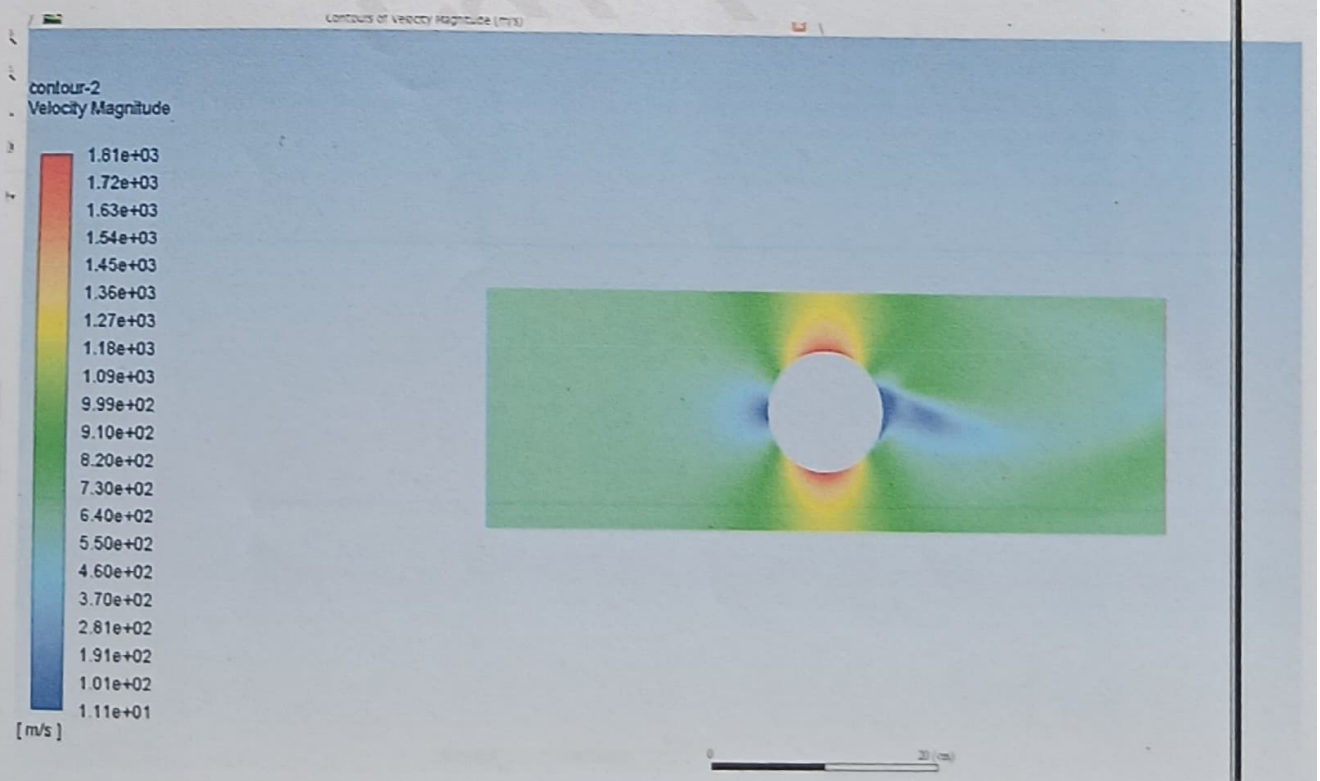


POST PROCESSING:

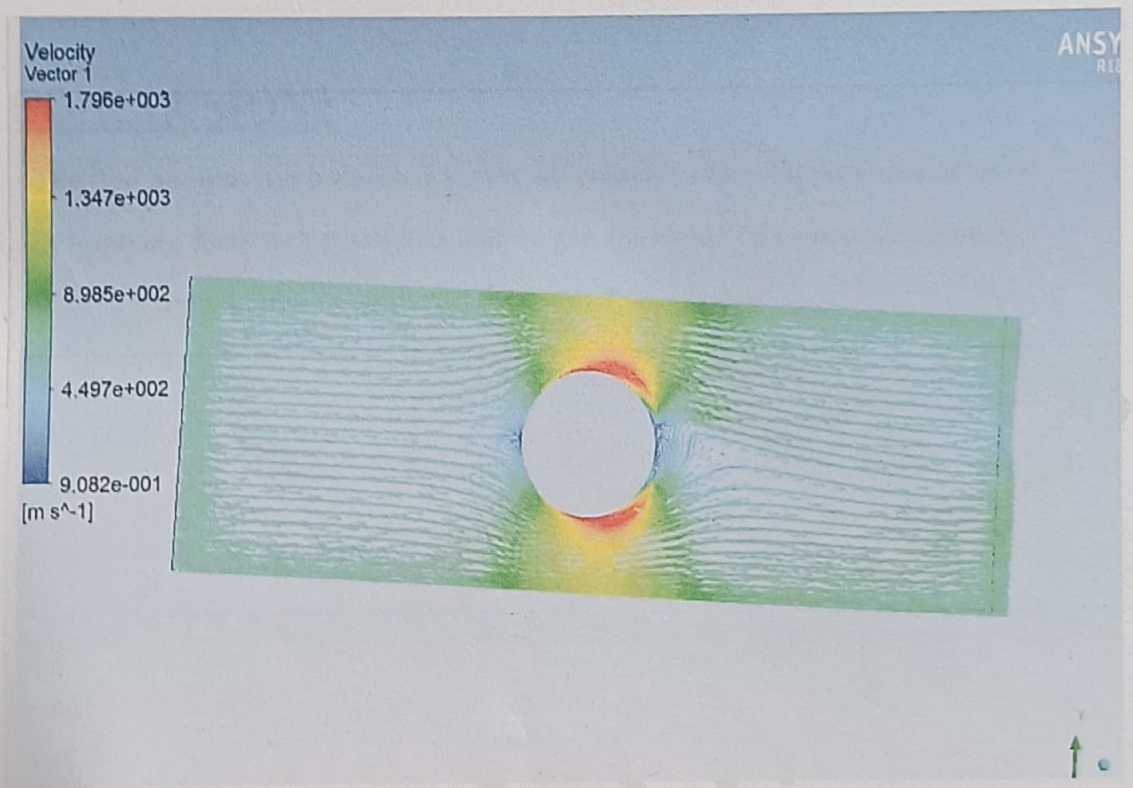
STATIC PRESSURE COUNTOR:



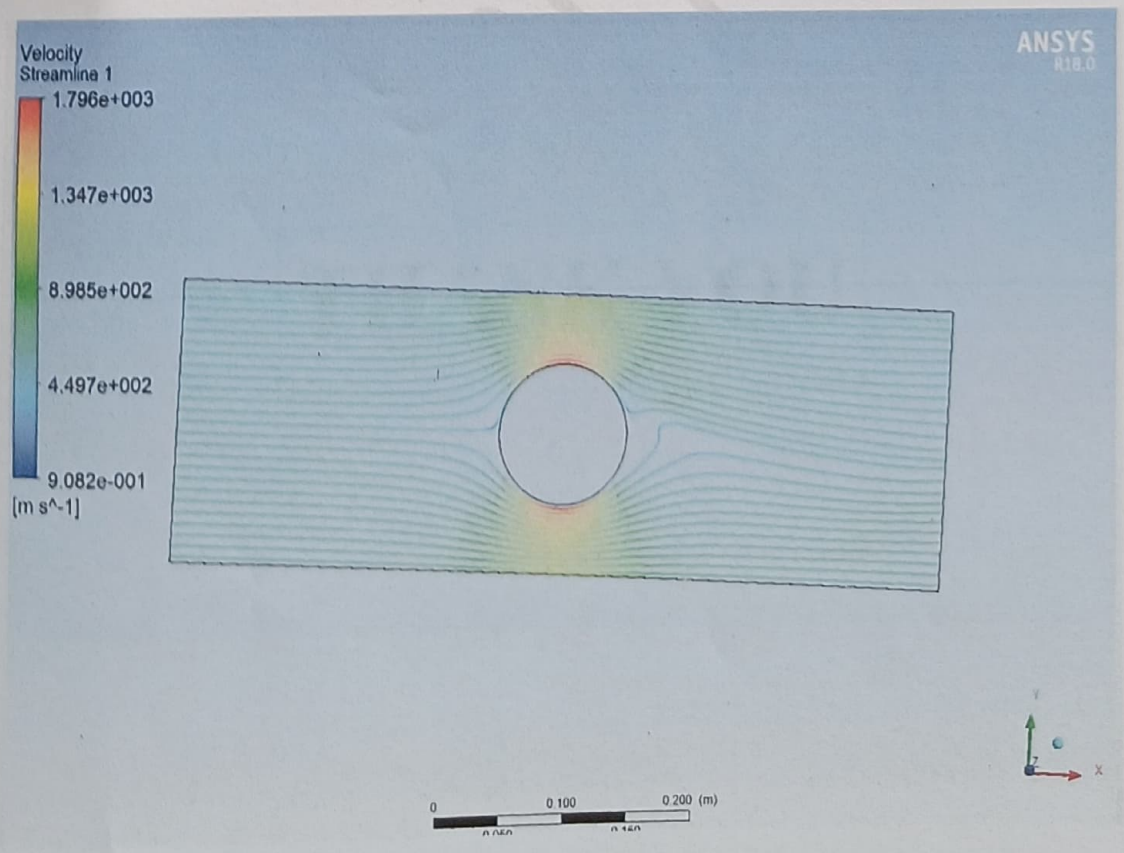
VELOCITY MAGNITUDE:



VELOCITY VECTOR:



VELOCITY STREAMLINE :



CONCLUSION :

The flow analysis has been done for the 2D cylinder of incompressible &inviscid by applying Boundary conditions and we got the Result of pressure Contours, velocity Contours and velocity vector.

THANK YOU