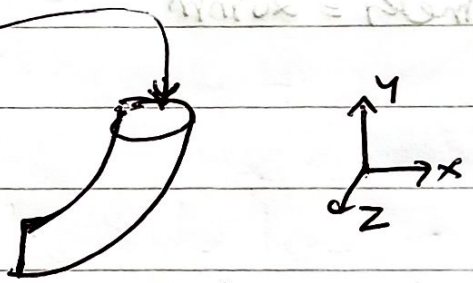
Elbow Geometry

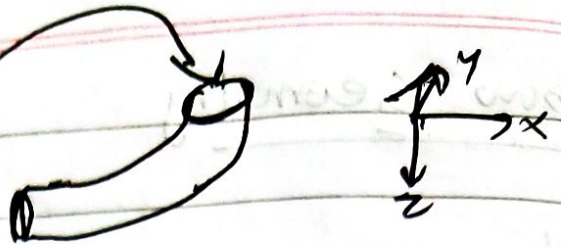
Units - mm
xy plane
Create - primitives - Torus
FD12, Angle 90°
FD10. Base y component -1
FD13, Inner radius 100 mm
FD14, Outer radius 200 mm
Base plane x y plane
Generate.
Face select, top face
Extrude.



Direction vector - Face Normal (To get this select Direction vector and then the face)
Direction - Normal
Operation - Add material
Depth = 200 mm

Select bottom face
Extrude
Direction vector - Face Normal
Direction Normal
Operation - Add material
Depth = 200 mm

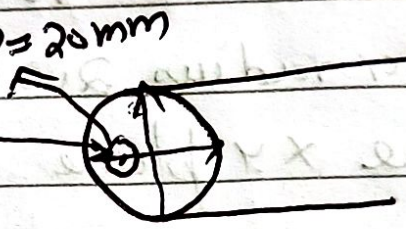
Select the top face



Click axis button at top

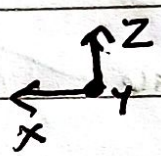
Generate

Select the Plane & turn the tree by right click → Look at



Sketching → circle

Diameter = 20mm



Extrude → Plane 4 → Sketch 1

Operation - Add material

Direction vector - None (Normal)

Direction - Reversed

Depth = 400mm

Generate

Tools → Symmetry

Symmetry plane - XY plane

Generate

Elbow

Mesh

Generate mesh
Mesh - sizing - capture curvature No
Generate
Insert sizing - Geometry as the body full
Select In Body sizing set element size as 5 mm
Mesh - insert - inflation
Select Geometry as the full body.
Select Boundary as the curved faces.
Set Maximum layers as 6, Growth rate 1.1
Generate.
Create named selection for inlet_large, inlet_small, pressureoutlet, ~~and~~ wall & symmetry

Setup

Double precision, solver process 4, start
General - Mesh - scale - View length unit in mm
- Pressure based, steady, Absolute
Physics - energy on.
Models - Viscous model - k epsilon (2 eqn), standard, Standard wall function
Materials - create edit - Fluent database
- select water liquid - set density 1000,

specific heat to 4216 J/kgK
Thermal conductivity to 0.677 W/mK

Cell zone conditions → solid → edit → Material name to water liquid → Apply - close

Boundary conditions → inlet large → edit → velocity magnitude as 0.45
Thermal - Temperature 293.15 K
Momentum - Turbulence - specification method
- Intensity & hydraulic diameter
- Turbulent intensity 5, Hydr. dia 100 mm
- Apply - close

Inlet small - edit - Momentum - Velocity Magnitude to 1.2 m/s.
Turbulence - specification method
- Intensity & Hyd. dia
- turbulent intensity 5 and hydraulic dia to 20mm
Thermal - Temperature 313.15 K
Apply - close

Solution – Methods – SIMPLE

Gradient to 'Green Gauss node based'

Report definitions → New surface report – Facet maximum

Change Name to 'temp-outlet', Set frequency 3 under create

Field variable to 'Temperature'

Select- pressure outlet from surfaces → Ok.

Definitions – edit – temp-outlet

Under 'Used in' select temp-outlet -r file

-edit. – Get Data every 1 iteration → Ok

Definitions – edit – temp-outlet

Under 'Used in' select temp-outlet -r plot → edit

→ Get Data every 1 iteration – Ok.

Definition – temp outlet -edit

Initialization → Initialize → Run calculation → Calculate

no. of iterations 400

Results → edit → Contour – rename to temperature

Set locations to symmetry.

Variable to temperature

Range to local

# of contours to 100 → Apply.

Under user locations and plots select
Default legend view.
Under text parameters - change font to fixed
- Apply.

Contour - rename to velocity.
Domains - all domains.
Locations - symmetry
Variable - pressure
Range - Local
# of contours = 100 → Apply.

Streamline → Domains - all domains
start from symmetry.
# of points 100
Variable - velocity

Animation - select 'streamline' and play

Vector - Domains - all domains
Locations - symmetry
Sampling - uniform, Variable - velocity
Apply

~~Symbol~~

Symbel – Flash 3D.

Then change methods - scheme to ~~Standard~~ COUPLED, Gradient: Gauss Node Based, Pressure: second order Momentum: second order