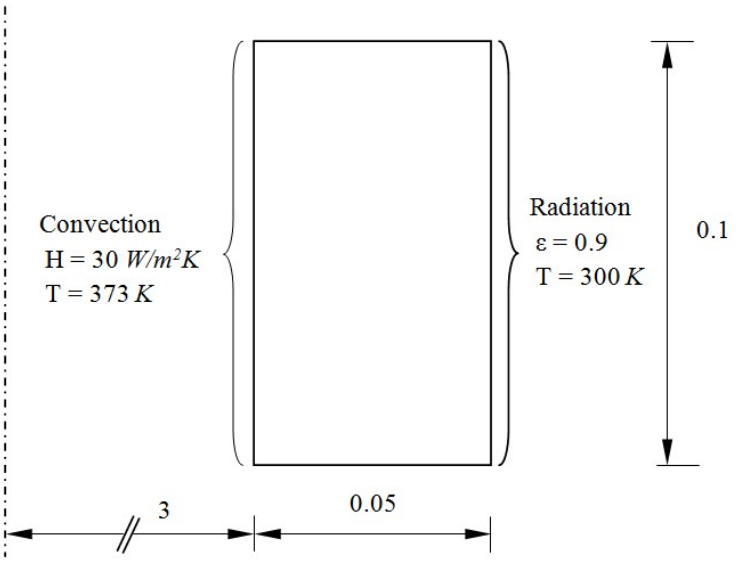
HEAT TRANSFER ANALYSIS OF AXI-SYMMETRIC PLATE WITH CONVECTIVE AND RADIATIVE BC



Property	Value
Geometry	Inner radius
	Outer radius
	Height
Mesh	2D Axisymmetric
Mesh size	5 X 1
Thermal conductivity (k_x)	1 *W/K*
Convective boundary condition	H=30 W/m^{2}K, T_α=373*K*
Radiative boundary condition	ε=0.9, T_α=300 *K*

PROCEDURE

1 Create key points at (3/0/0) and (3.05/0.1/0)

Commands : POINT, ADD

Menu : Geometry → Key point → Create → Add

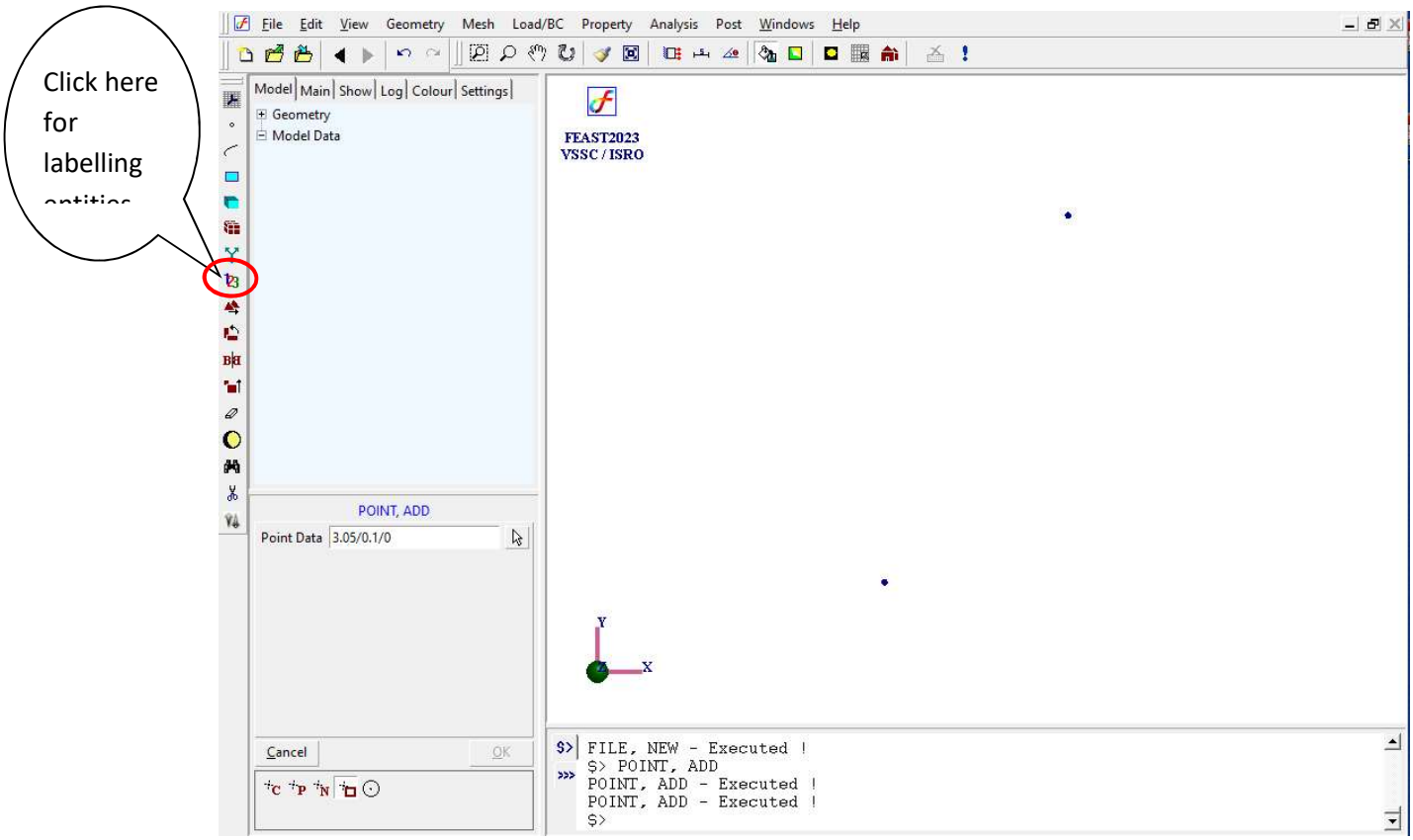
Parameters : (To be filled by the user)

Point Data	3/0/0

Point Data	3.05/0.1/0

After filling the parameters click *apply* button. If apply button is not active then you press *ctrl+enter* key.

At the end of the above operations, your screen looks like this.



2 Create quadrilateral surface on two diagonal points

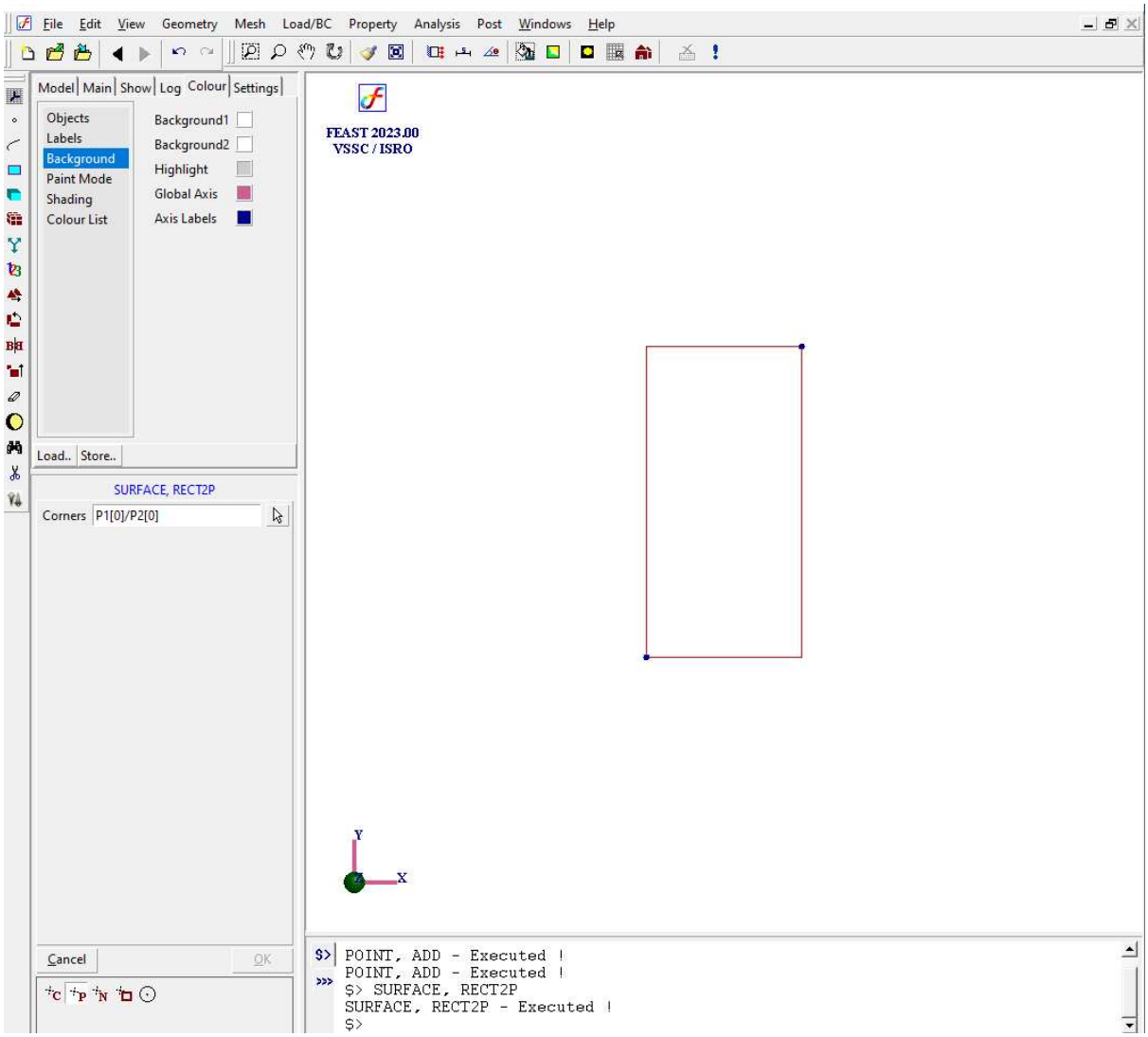
Command : SURFACE,RECT2P

Menu : Geometry → Surface → Create → Rect2P

Parameters : (To be filled by the users)

Corners	Use mouse to pick the points. P1/P2

At the end of the above operations, your screen looks like this.



3 Meshing using quadrilateral elements

Menu : Mesh → MeshGen → QUAD

Command : MESH,QUAD

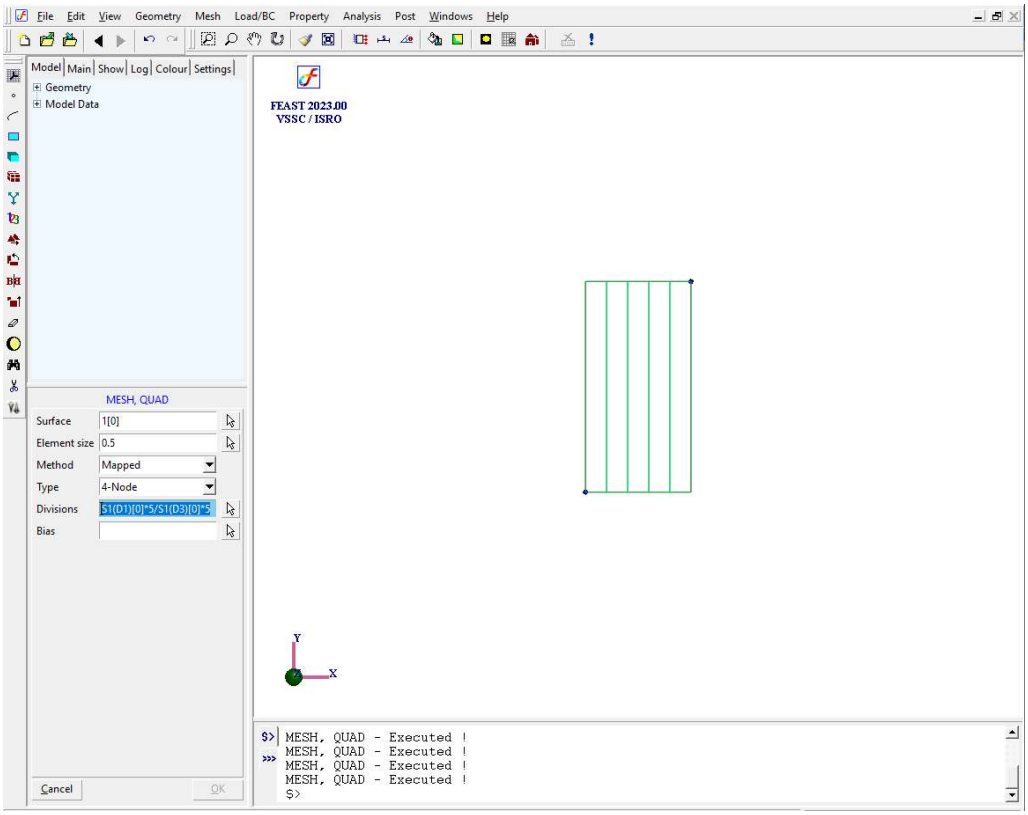
Parameters :

Surface	Use mouse to select the surface
Element size	0.5
Method	Mapped
Type	4 node
Divisions	S1(D1)[0]*5/S1(D3)[0]*5
Bias	

Note:

Divisions along each edge can be varied by selecting the corresponding edges and right/left clicking the mouse point to adjust the subdivisions. Eg: S1(D1):5 shows 5 sub divisions along edge1.

At the end of the above operations, your screen looks like this.



4 Convert the QUAD4 elements to QUAD8 element

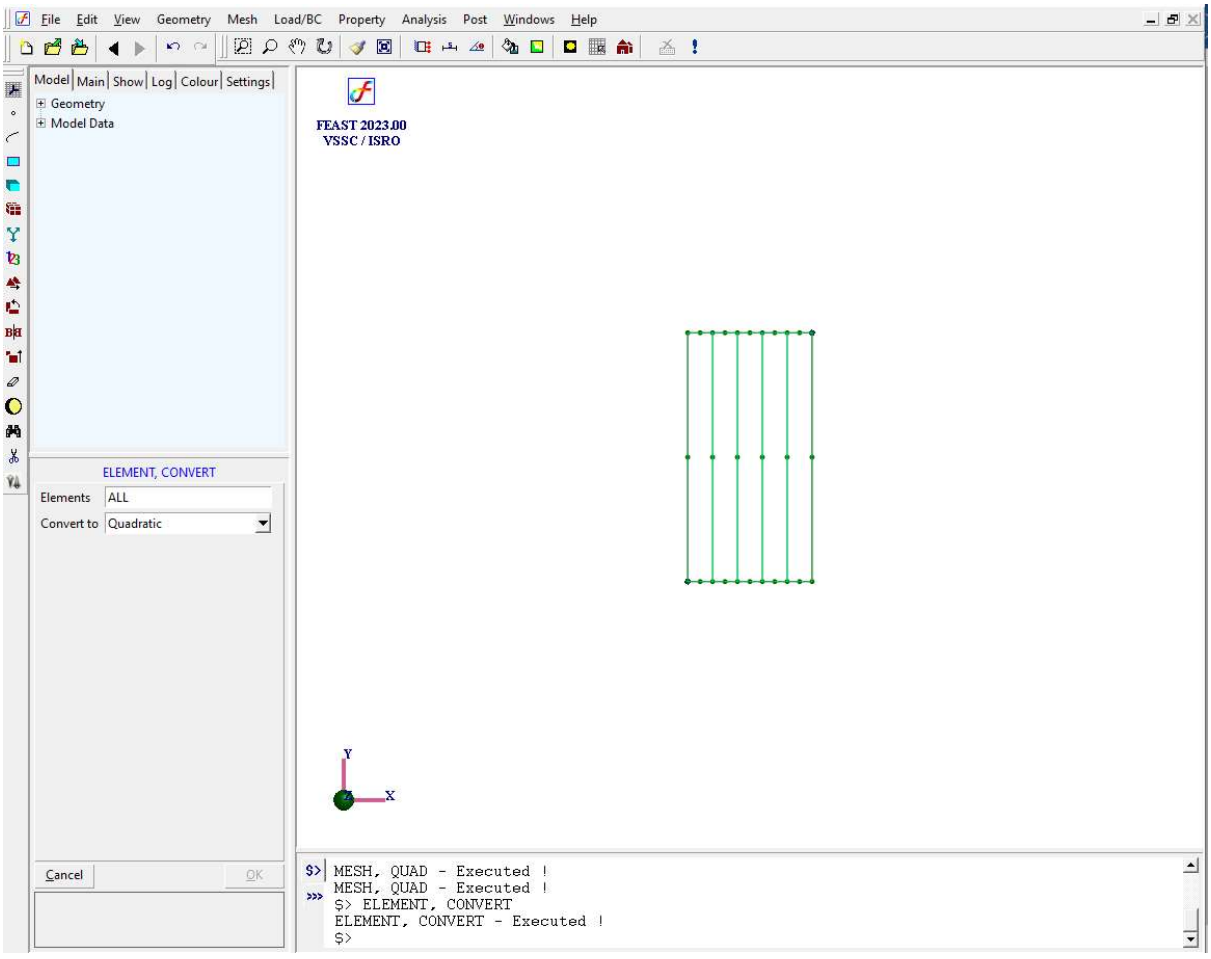
Command : ELEMENT, CONVERT

Menu : Mesh → Element → Modify→ Convert

Parameters :

Elements	All
Convert to	Quadratic

At the end of the above operations, your screen should look like this.



5 Change the element type

Command : ELEMENT,TYPE

Menu : Mesh → Element → Modify→ Type

Parameters :

Elements	All
Element Type	Axisymmetric

6 Set the analysis type

Menu : Analysis → Analysis Type

Command : ANTYPE, ADD

Analysis Type	HT Steady State

7 Specify heat transfer boundary conditions

1) Convective boundary condition

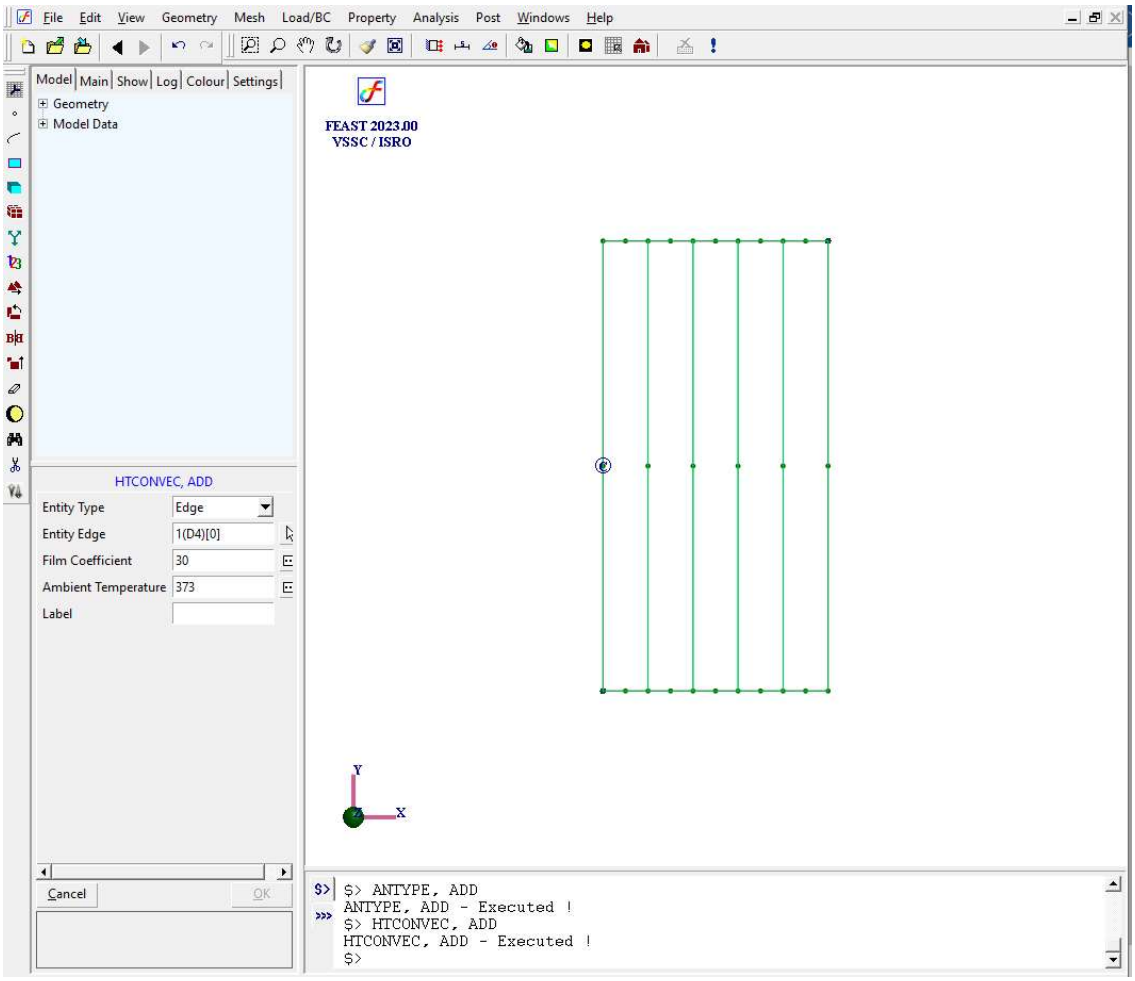
Menu : Load/BC → Thermal → Convection

Command : HTCONVEC, ADD

Parameters :

Entity Type	Edge
Entity Edge	Select edge4 of first element five / (1D4)
Film Coefficient	30
Ambient Temperature	373*K*

At the end of the above operations, your screen should look like this.



2) Radiative boundary condition

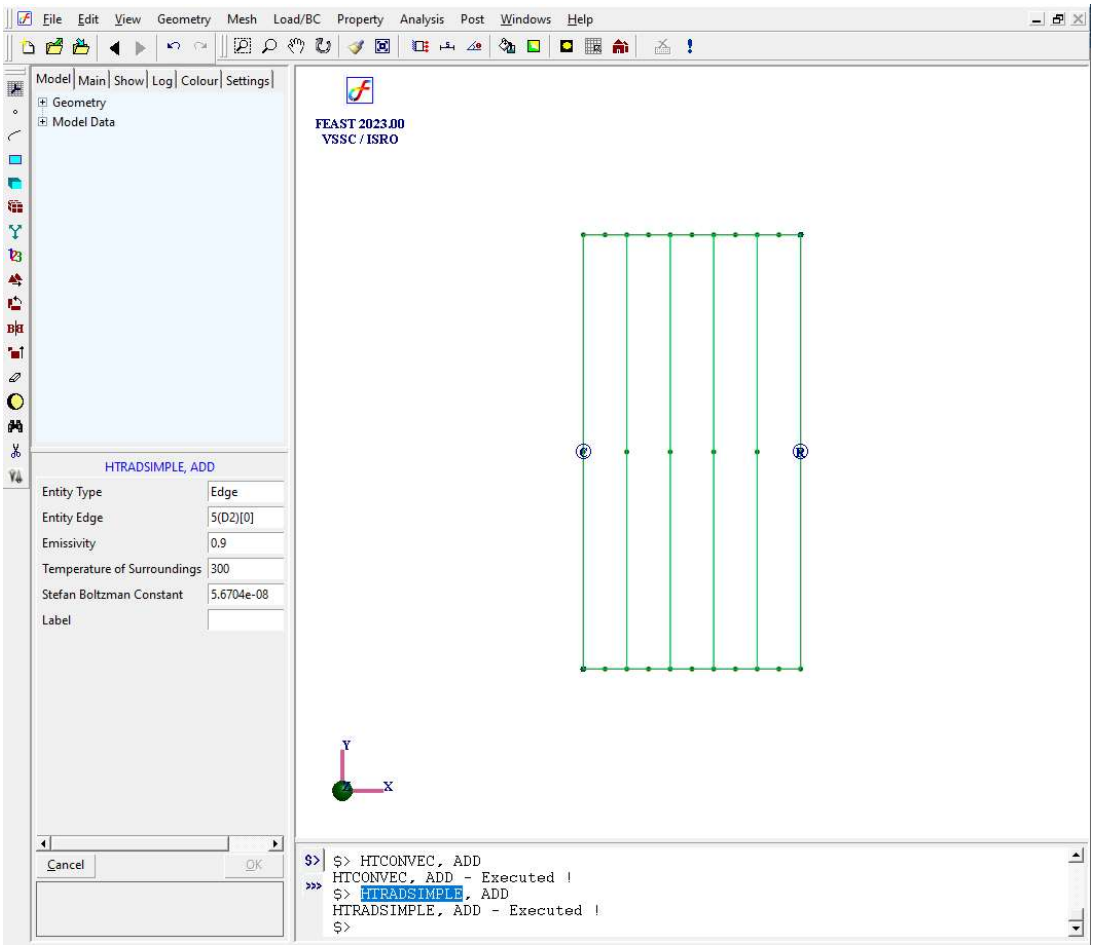
Menu : Load/BC → Thermal → Radiation → Simple

Command : HTRADSIMPLE, ADD

Parameters :

Entity Type	Edge
Entity Edge	Select right side edge
Emissivity	0.9
Temperature of surroundings	300*K*
Steffan Boltzmann Constant	5.6703e-8
Label	

At the end of the above operations, your screen should look like this.



8 Specify material properties

Menu : Property → Material → Thermal → Isotropic

Command : MATERIAL, HTISOTROPIC

Parameters :

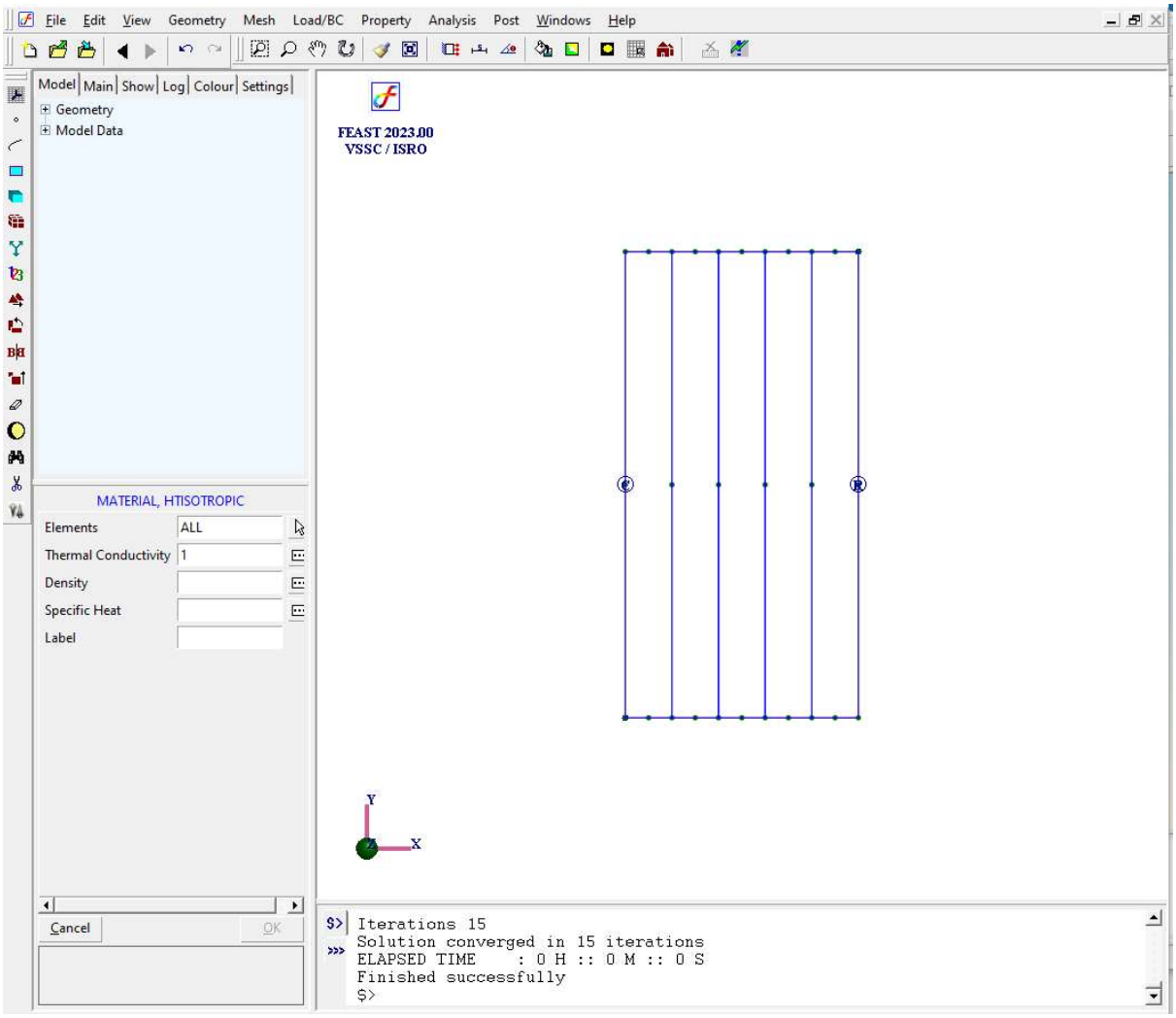
Elements	All
Thermal Conductivity	1

9 Save the project

Menu : File → Save

10 Activate solver

Click Run Solver button



After the solution is completed the message *"Finished successfully"* appears in the *message box.*

11 Perform post processing

a) Contour

Menu : Post → Contour

Command : POST, CONTOUR

Item	Temperature
Restrict To	
Contour Type	Band

Parameters :

No. of contours	9
Decimal Places	2

At the end of the above operations, your screen should look like this.