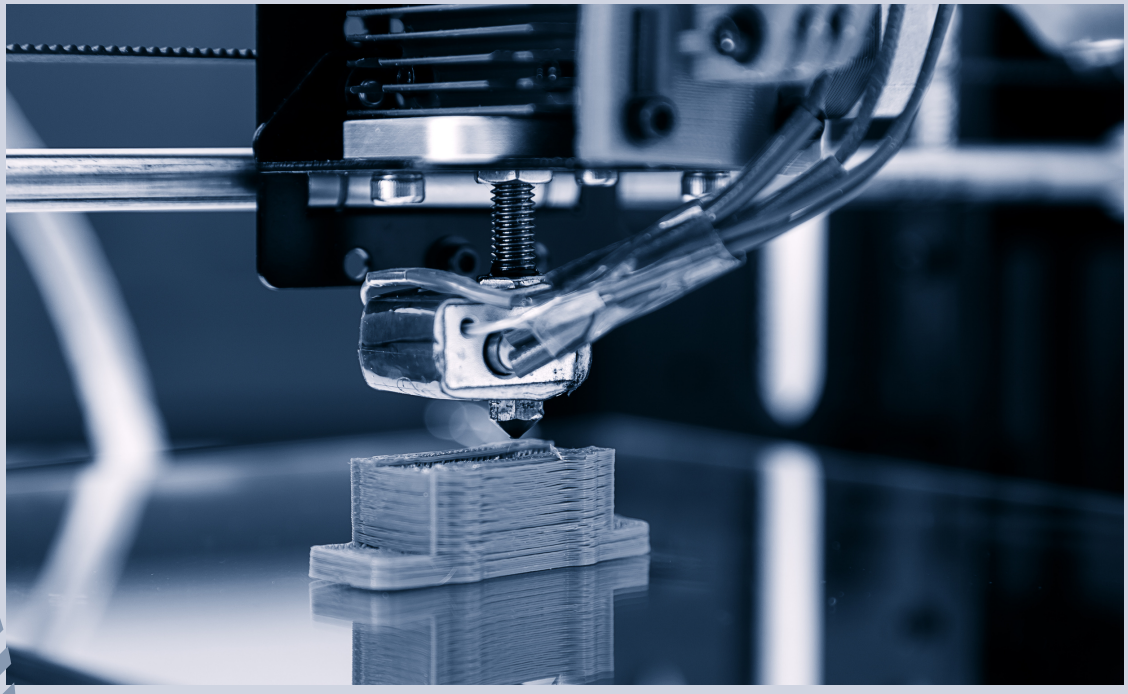

CAD CAM

EXPERIMENT-06

Thermal Analysis

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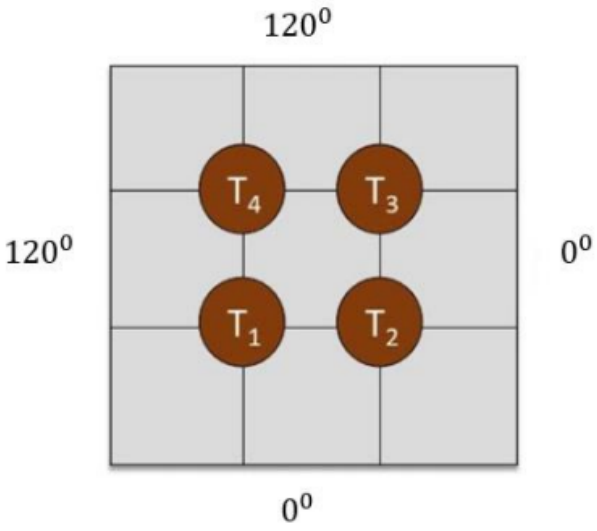
20BME0136

- Ansys

Problem -6

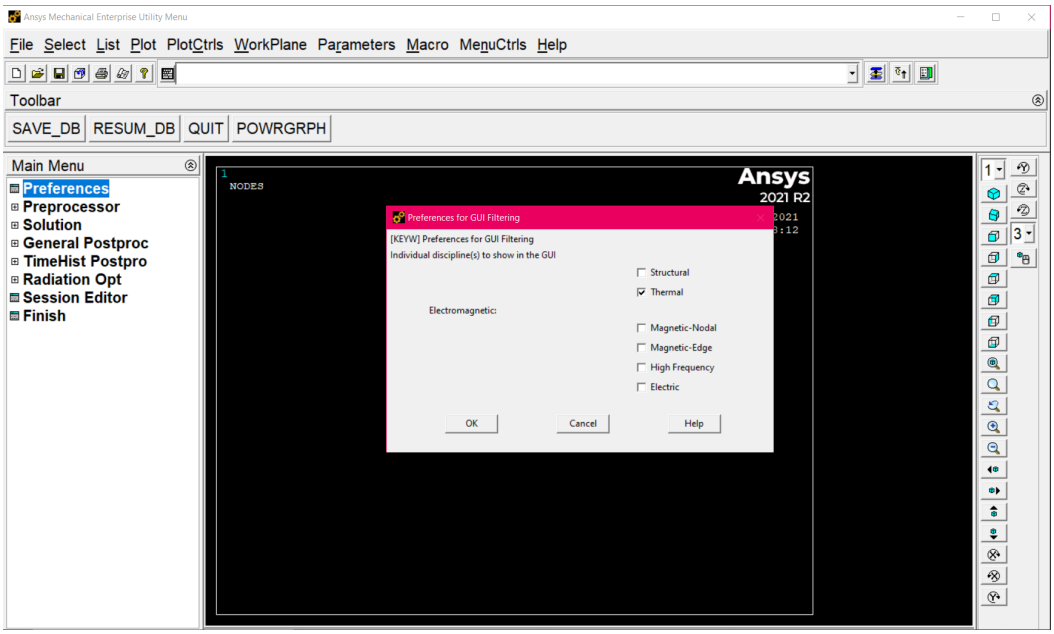
A steel plate of 500 X 500 mm is maintained at temperature as shown in the figure. Find out the steady state temperature at T_1 T_2 T_3 & T_4. Thermal conductivity of the material is 54 W/m^{0}C.



Steps to Find the steady state temperature :

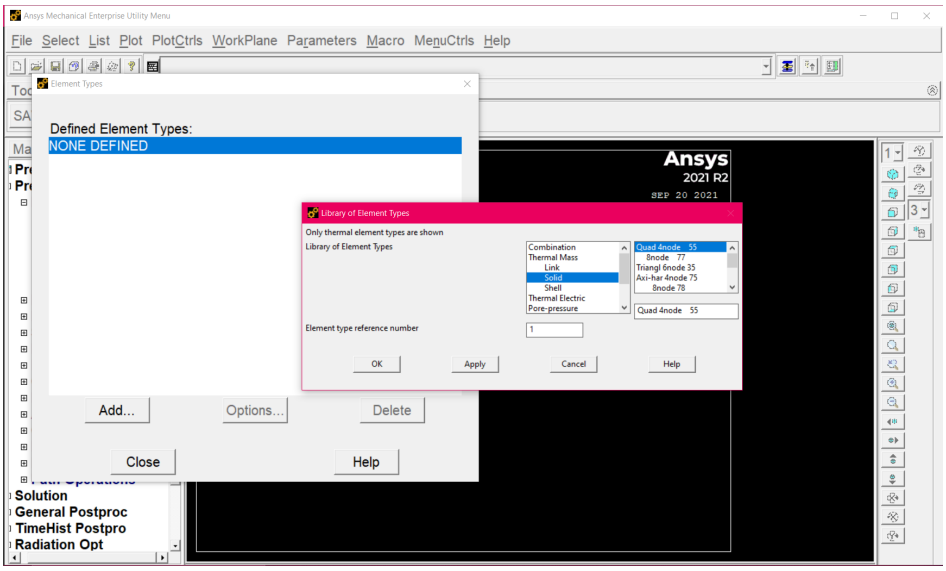
1) First, we launch the mechanical APDL product and the window opens.

2) The given problem is a thermal analysis. In order to choose that we must go to, Main Menu

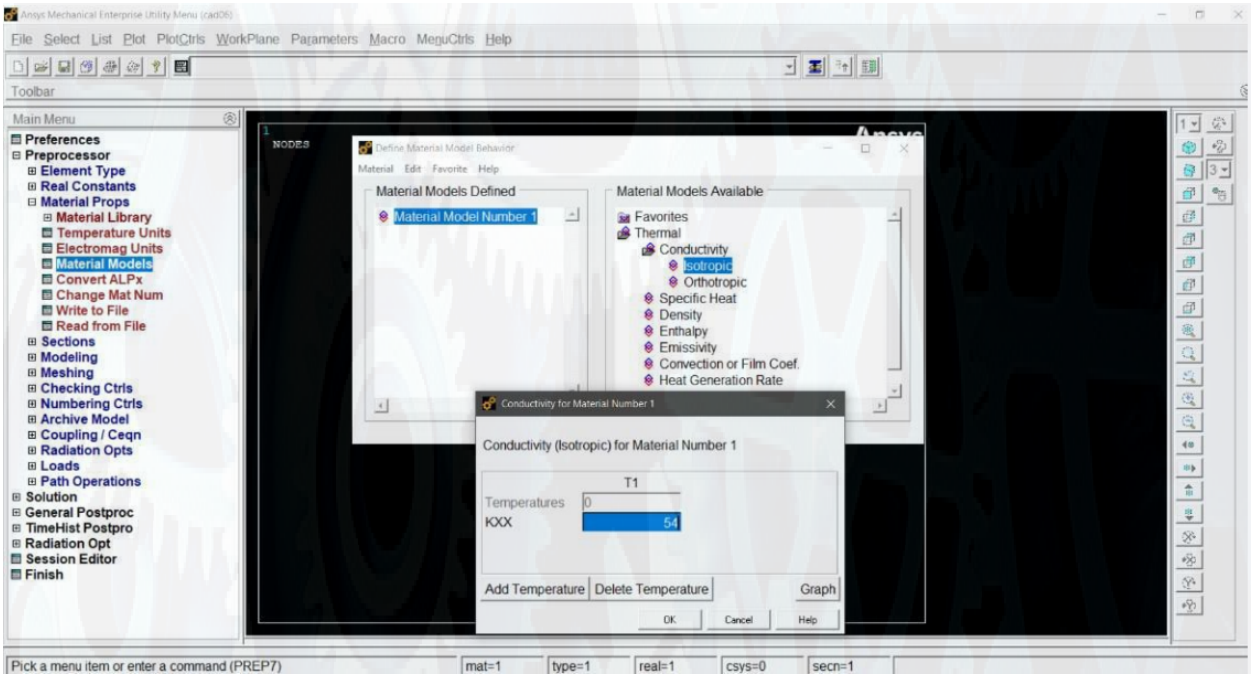


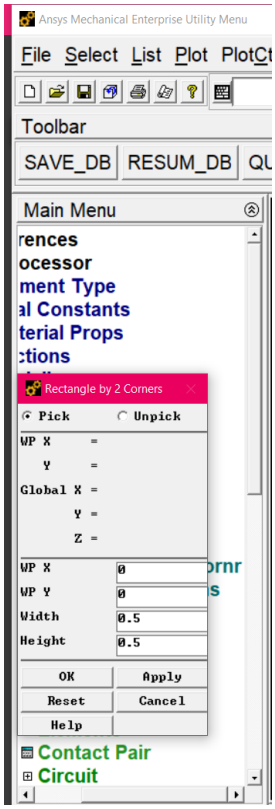
Preferences Thermal OK .

3) In order to add our element (our element being link) we must go to, Main Menu Preprocessor Element Type Add/Edit/Delete Add… Thermal mass Solid Quad 4node 55 OK.

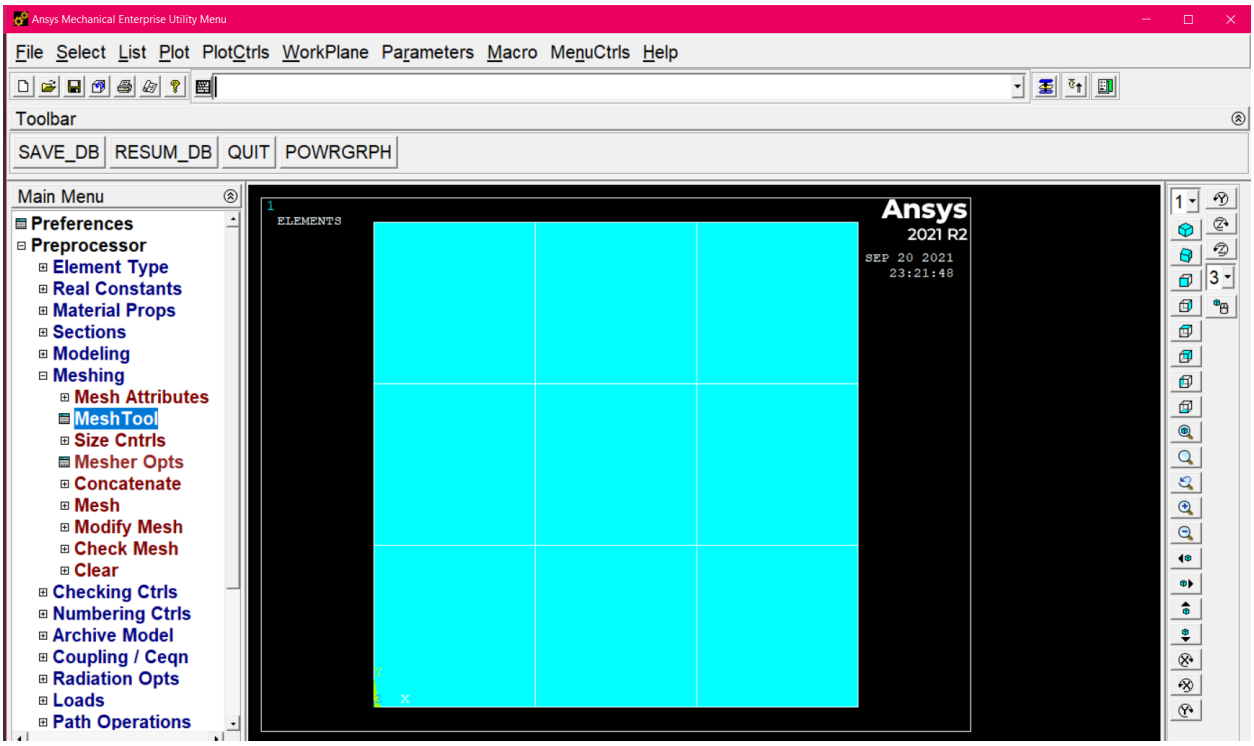


4) Next, we define the material property given in the problem i.e. Conductivity by, Preprocessor Material Props Material Models Thermal Conductivity Isotropic and enter the value for conductivity = 54 W/moC.



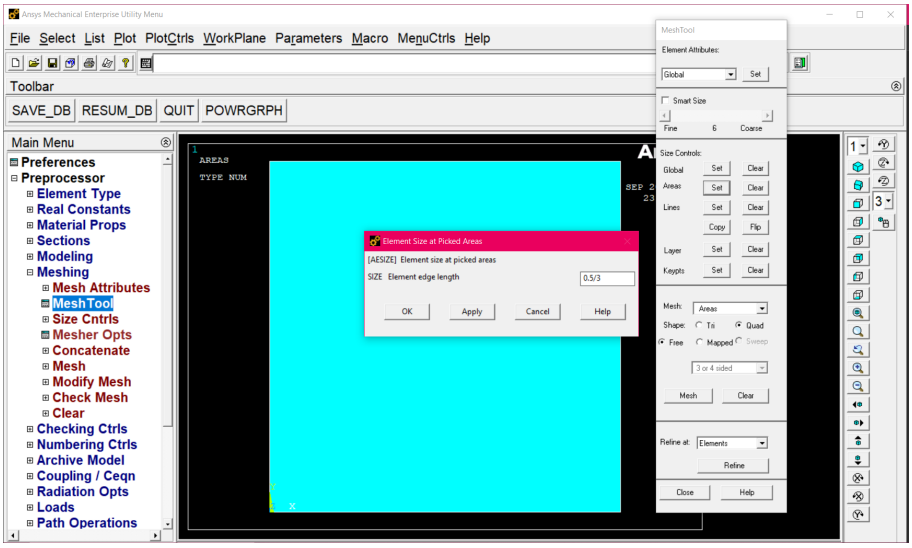


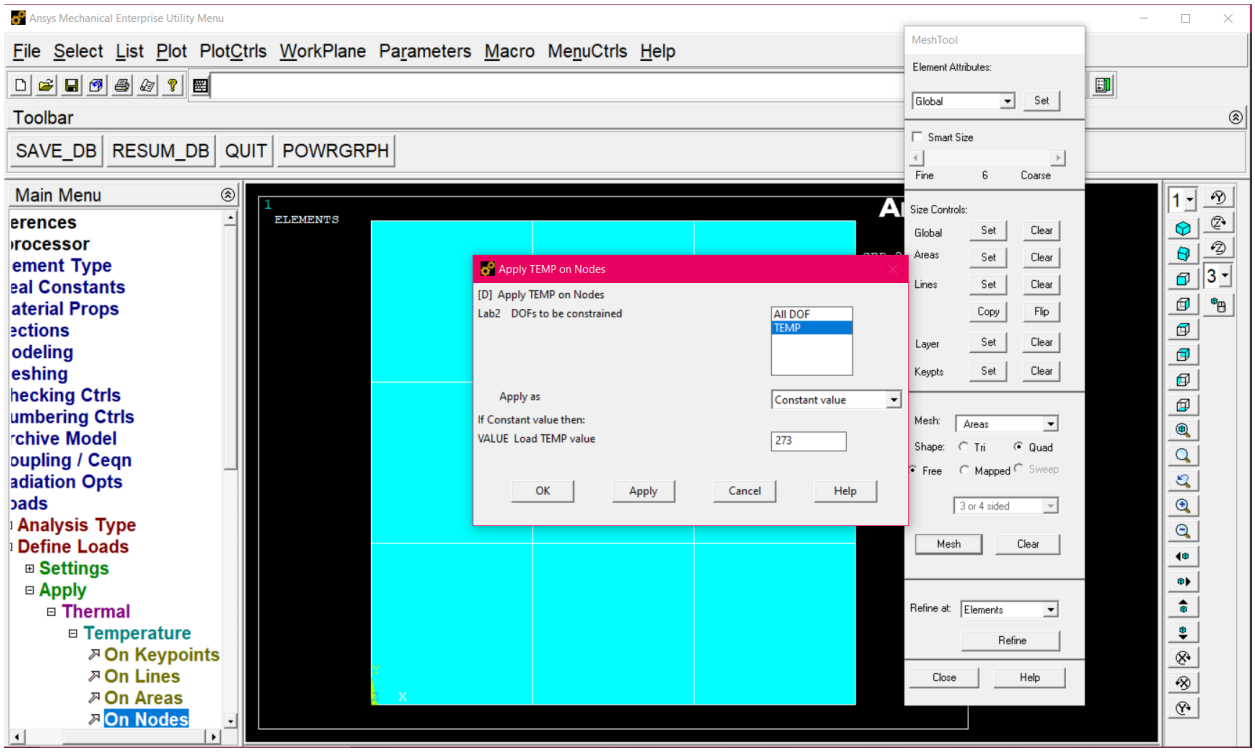
5) Now, we move on to modelling and we start by defining the area (500mm x 500mm). This is the area generated.



6) In order to convert the above geometry into a mesh, we use the mesh tool. Follow the order of the images I have pasted below.

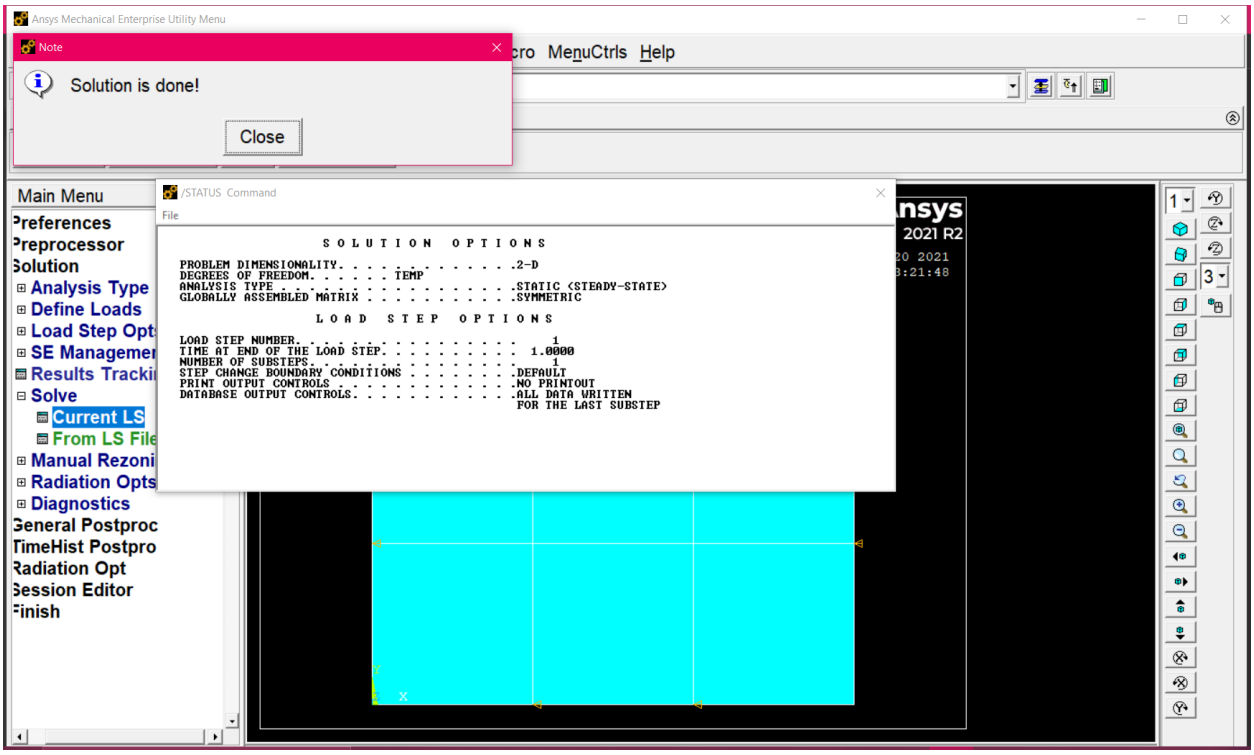
When you click the mesh tool the following window pops up, we select Set in Areas.
In the following window pop up, choose Pick All
Specify the edge length.



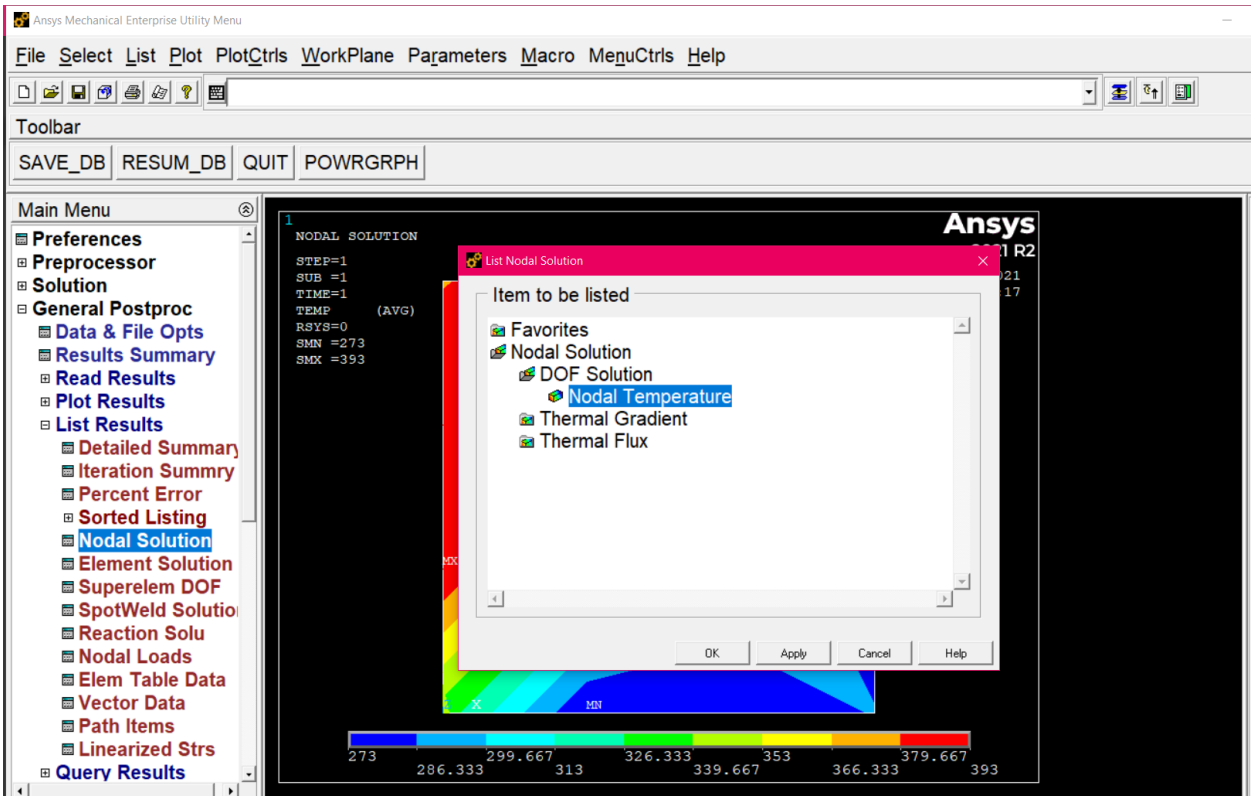


Choose raise hidden, click mesh in the following window pop up, then choose the geometry and select OK.

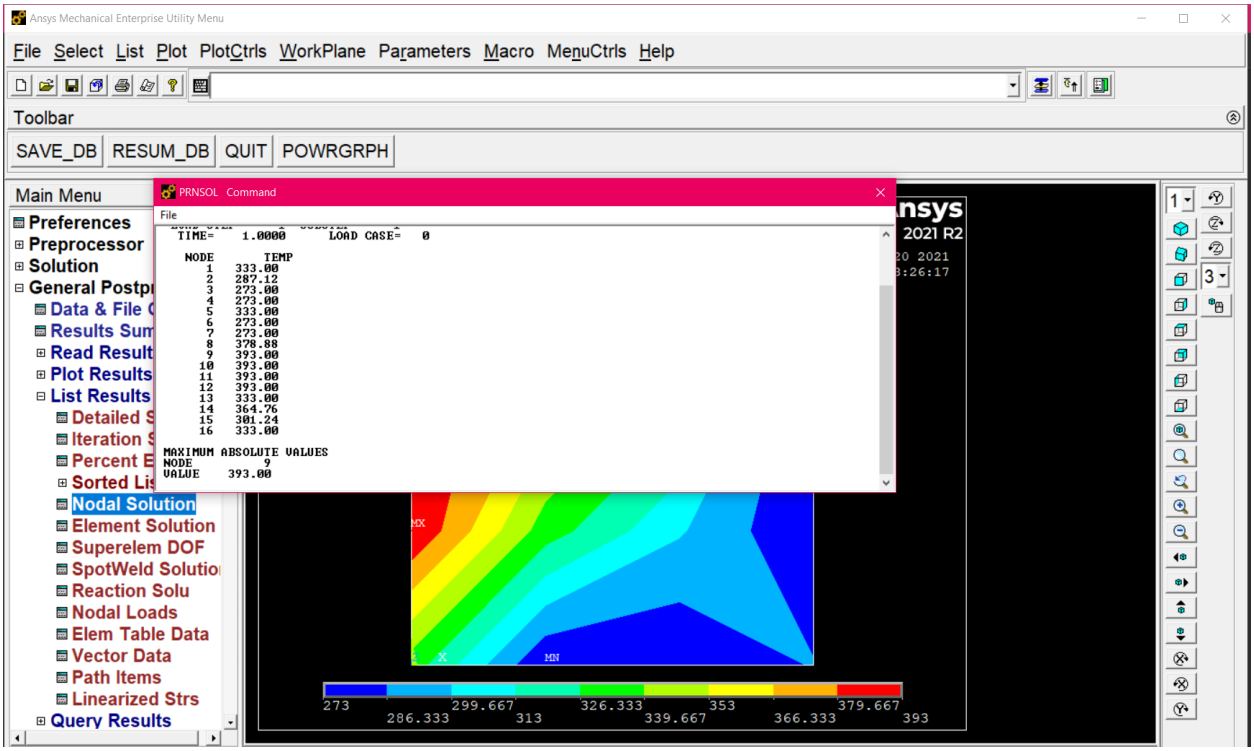
STEP – 07: In order to define the Temperature as given in the problem, we must choose, Preprocessor → Loads → Define Loads → Apply → Thermal → Temperature → On Nodes Then, select the nodes and specify the respective temperatures.



STEP – 08: In order to see the temperature gradient of the geometry we must go to, Solution → Solve → Current LS → OK
General Postproc → Plot Results → Contour Plot → Nodal Solu → Nodal Solution → DOF Solution → Nodal Temperature Given below is the temperature profile, it varies from 273K to



379.667K



STEP – 09: In order to find the temperatures at each node we must select, List → Results → Nodal Solution → DOF Solution → Nodal Temperature

Steady State Temperatures are: T1 = 323.67K, T2 = 297K, T3 = 323.67K, T4 = 363.67K.