School of Engineering and Applied Science (SEAS), Ahmedabad University

Name: _____ Roll no.: _____

PhD

CHE507 Advanced Computational Fluid Dynamics: End Term Exam (Winter Sem); Marks: 50 M, Wt.: _20_ %

April 26, 2025, Saturday, 08.00 AM – 10 AM

Instructions:

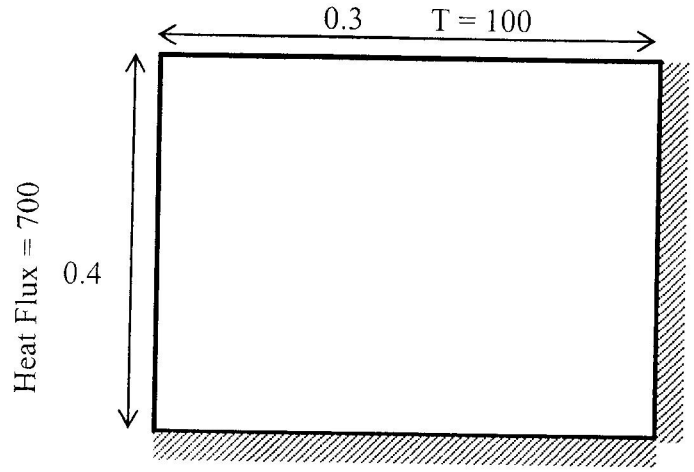
1 All sections are compulsory.
2 All acronyms carry their usual meaning.
3 Assume suitable data wherever necessary and specify it clearly in your answers.

Answer the Questions

Consider a two dimensional plate of thickness 1 cm. The thermal conductivity of the plate material is K = 200 //mK. The west boundary receives a steady heat flux of 700 kW/m^2 and south and east boundaries are insulated. If the north boundary is maintained at a temperature of 100 ^{0}C use a uniform grid with $\Delta x = \Delta y =$ 0.1 m to calculate the steady state distribution at all nodes. The heat conduction equation for two dimensions is given by

$$\frac{d}{dx}\left(k\frac{dT}{dx}\right)+\frac{d}{dy}\left(k\frac{dT}{dy}\right)=0$$

Discretize the above equation. Divide the geometry of below Figure into 12 nodes. Find the temperature values on each of the nodes for the first iteration. Use Tridiagonal Matrix Algorithm for solving the system of linear algebraic equations. (50 M)



Insulated

All the best
