INDIAN INSTITUTE OF TECHNOLOGY KANPUR
DEPARTMENT OFMECHANICAL ENGINEERING

ME685A - ASSIGNMENT II

9th September 2020

Solve the following second order ordinary differential equations (I and II) arising from a spatially distributed model of heat conduction in a slab. Use analytical as well as numerical methods. The latter can be based on discretization of the concerned derivative of temperature.

(I)
$$\frac{d}{dx}\left[\frac{dT}{dx}\right]=0 \qquad 0<x<1$$
$$T(x=0)=1; \qquad T(x=1)=0$$

(II)
$$\frac{d}{dx}\left[(1-0.1\times T)\frac{dT}{dx}\right]=0 \qquad 0<x<1$$
$$T(x=0)=1; \qquad T(x=1)=0$$

The spatial region is to be divided into four segments.
Tabulate and compare numerical and analytical solutions.

{*With four segments, you will get a 5 × 5 matrix. Since boundary conditions are known at the ends, this can be reduced to 3 × 3 system. Solve the 3 × 3 system of linear algebraic equations using hand calculations or a hand calculator.* }