PEC 1. Problems in Finite Differences

Finite Differences and Finite Elements

URV-UOC. 2020-21

1) Solve the heat equation inital-boundary-value problem:

$$\begin{aligned} u_t &= 2u_{xx} \\ u(x,0) &= -\sin 3\pi x + \frac{1}{4}\sin 6\pi x \\ u(0,t) &= u(1,t) = 0 \end{aligned}$$

2) Solve the Lapalce boundary value problem:

$$\begin{aligned} u_{xx} + u_{yy} &= 0 \\ u(x,0) &= \sin 3\pi x \\ u(x,1) &= \sin \pi x \\ u(0,y) &= u(1,y) = 0.0 \end{aligned}$$

3) A rectangular plate of dimensions $L_x = 2$ and $L_y = 1$ is heated initially at a uniform temperature $T(x,y) = T_0 = 100^o C$. The upper border is kept completely insulated, while the rest of the borders are maintained at a constant temperature of $T = 0^o C$. Compute the distribution of temperature of the plate $T(x,y)$ as a function of time.