NODE 1:

$$h_{air}\frac{\Delta x}{2}(T_\infty - T_1^i) + h_{wat}\frac{\Delta y}{2}(T_\infty - T_1^i) + k\frac{\Delta x}{2}\left(\frac{T_4^i - T_1^i}{\Delta y}\right)$$
$$+ k\frac{\Delta y}{2}\left(\frac{T_2^i - T_1^i}{\Delta x}\right) + \rho\frac{\Delta x}{2}\frac{\Delta y}{2}C_p\left(\frac{T_1^{i+1} - T_1^i}{\Delta t}\right) = 0$$

$$(10)\left(\frac{0.1}{2}\right)(15 - T_1^i) + (100)\left(\frac{0.1}{2}\right)(15 - T_1^i) + (120)\left(\frac{0.1}{2}\right)\left(\frac{T_4^i - T_1^i}{0.1}\right)$$
$$+(120)\left(\frac{0.1}{2}\right)\left(\frac{T_2^i - T_1^i}{0.1}\right) + \rho C_p\left(\frac{0.1}{2}\right)\left(\frac{0.1}{2}\right)\left(\frac{T_1^{i+1} - T_1^i}{10}\right) = 0$$

$$7.5 - 0.5T_1^i + 75 - 5T_1^i + 60T_4^i - 60T_1^i$$
$$+ 60T_2^i - 60T_1^i + 30690537.08\left(\frac{0.1^2}{4}\right)\left(\frac{1}{10}\right)(T_1^{i+1} - T_1^i) = 0$$

$$\boxed{\begin{aligned} \rho C_p &= \frac{k}{\alpha} \quad \text{since} \quad \alpha = \frac{k}{\rho C_p} \\ \therefore\ &= \frac{120}{3.91\times 10^{-6}} \\ &= 30690537.08 \end{aligned}}$$

$$7.5 - 0.5T_1^i$$
$$\cancel{7.5 - 0.5} + 75 - 5T_1^i + 60T_4^i - 60T_1^i$$
$$+ 60T_2^i - 60T_1^i + 7672.63T_1^{i+1} - 7672.63T_1^i = 0$$

$$7672.63T_1^{i+1} = 7798.13T_1^i - 60T_2^i - 60T_4^i - 82.5$$
$$T_1^{i+1} = \frac{7798.13T_1^i - 60T_2^i - 60T_4^i - 82.5}{7672.63}$$

$$T_1^{i+1} = 1.0164T_1^i - 0.0078T_2^i - 0.0078T_2^i - 0.0108$$