

② a)

$$\underbrace{\begin{pmatrix} 1+2a\lambda & -a\lambda & & \\ -a\lambda & 1+2a\lambda & -a\lambda & \\ & \ddots & \ddots & \\ -a\lambda & 1+2a\lambda & & -a\lambda & 1+2a\lambda \end{pmatrix}}_{L_{h,k}} \underbrace{\begin{pmatrix} U_1^{l+1} \\ \vdots \\ U_{N-1}^{l+1} \\ U_N^{l+1} \end{pmatrix}}_{U_j^{l+1}} = \underbrace{\begin{pmatrix} U_1^l \\ \vdots \\ U_{N-1}^l \\ U_N^l \end{pmatrix}}_{U_j^l} + a\lambda \underbrace{\begin{pmatrix} \alpha U_1^{l+1} \\ 0 \\ \vdots \\ 0 \\ \beta U_N^{l+1} \end{pmatrix}}_{f_{h,k}}$$

② b) computationally expensive.

we need to calculate inverse of matrix
in each time step.