Mixed Method

$$\theta \left[\text{Explict} \right] + (1-\theta) \left[\text{Implicit} \right] \Rightarrow \text{Mixed Method}$$

$$0 < \theta < 1$$

$$\theta [T] \{ \vec{P}^n \} + (1-\theta)[T] \{ \vec{P}^{n+1} \} + \frac{1}{\Delta t} [B] \{ \vec{P}^{n+1} \}$$

$$= \frac{1}{\Delta t} [B] \{ \vec{P}^n \} + \{ \vec{Q} \}$$

$$\left[(1-\theta)[T] + \frac{1}{\Delta t}[B] \right] \{ \vec{P}^{n+1} \} = \left(\frac{1}{\Delta t}[B] - \theta[T] \right) \{ \vec{P}^n \} + \{ \vec{Q} \}$$

For $\theta = \frac{1}{2} \rightarrow$ Crank-Nicholson

$$\frac{\partial p}{\partial t}^{n+\frac{1}{2}} = \frac{p^{n+1} - p^{n-1}}{2\Delta t} + \theta(|\Delta t|^2)$$

$\underbrace{\qquad\qquad}$
2nd order accurate